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THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

NOTICE.

The Plate illustrating the Nicobar Megapode (*Megapodius Nicobariensis*) which accompanies this paper, not having arrived from England, will be published in the next number of the Journal.

EDITORS.

whole, very constant in shape. The wings are rather short and rounded, the first primary either shorter or very little longer, than the tenth or last. The fifth secondary is always present.

The great majority of these birds lay on the ground, but the Tragopans nest on trees, and the Megapodes make huge mounds in which they bury their eggs. The young are hatched covered with down or feathers, and can run about almost immediately after leaving the egg.

* The instalment of this paper which appeared in the last Journal was through a clerical error headed Part XVII instead of Part XVI.—*Editors*.

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BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART XVII.*

With Plate.

Order—*GALLINÆ.*

The Order *Gallinæ* contains the whole of the true land game birds, including the Megapodes, or Mound Birds, but excluding those land birds already dealt with in the previous volume. In the present order will be found the Peafowl, Jungle Fowl, Pheasants, Spur Fowl, Partridges, Quails and Megapodes, all represented in India, and Grouse, Turkeys, Guinea Fowl, Curassows and Guans, of which we have no representatives, and none of which with the exception of the first named are ever found in Asia.

All the Genera, as contained in this order, are birds with strong, well-built legs, well fitted for progress on the ground; the tarsus is frequently furnished with one or more spurs, in some cases on that of the male only, and in others on the tarsi of both sexes. The hallux, or hind-toe is always present, and the nails or claws are, in all but the *Megapodiidæ*, short, blunt and very strong, and almost straight on their lower surface. The bill is short and stout, and, on the whole, very constant in shape. The wings are rather short and rounded, the first primary either shorter or very little longer, than the tenth or last. The fifth secondary is always present.

The great majority of these birds lay on the ground, but the Tragopans nest on trees, and the Megapodes make huge mounds in which they bury their eggs. The young are hatched covered with down or feathers, and can run about almost immediately after leaving the egg.

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The body feathers always possess an after-shaft; the spinal feather tract is well defined on the neck, and continues straight down the back. Except in *Agusianus* an oil-gland is present in every genus.

The deep plantar tendons are connected by a fibrous vinculum but divide again, the *flexor perforans digitorum* to supply the three front toes, and the *flaxor longus hallucis* the hallux. The ambiens muscle, accessory femoro caudal, semitendinosus, accessory semitendinosus are always present, and the femoro-caudal in all but the Peafowl and Turkeys. The palate is schizognathous, the nasals holorhinal.

"True basipterygoid processes are wanting, but there are sessile facets situated far forward on the spenoidal rostrum. Cervical vertibræ 16. The sternum has two deep incisions on the posterior border on each side of the keel; the inner xiphoid process between the two is shorter than the outer which is bent over the inner ribs, and expanded at the end. The episternal process of the rostrum is completely perforated to receive the inner ends of the caracoids." (Blanford.)

The Order *Gallinæ* contains two sub-orders, both of which are represented in India, the *Peristoropodes* and the *Alectoropodes*.

KEY TO SUB-ORDERS.

Inner notch of sternum less than half the length of the entire sternum. Hallux and anterior digits on the same level ... ... *Peristoropodes.*

Inner notch of sternum more than half the length of the entire sternum. Hallux raised above level of anterior digits ... ... *Allectoropodes.*

In the Sub-Order *Peristoropodes*, Ogilvie-Grant includes two families, the *Megapodiidæ* and the *Cracidæ*, the first containing our *Megapodes*, and the second the South American Curassows, but Sharpe in his Hand-List elevates both these families to be sub-orders and designates them *Megapodii*, and *Craces*. In the latter family, however, we in India have no interest.

The family *Megapodiidæ* as defined by Ogilvie-Grant, contains seven genera of which only one, *Megapodius*, occurs within Indian limits. This genus contains 15 species according to Ogilvie-Grant, and 17 in Sharpe's Hand-List, two species, *affinis* and *senex*, being added by him. Of these 17 species one, *Megapodius nicobariensis*, is found in the Nicobars and so comes into our Indian avifauna.

MEGAPODIUS NICOBARIENSIS.

The Nicobar Megapode or Mound Bird.

Megapodius nicobariensis.—Blyth, J. A. S. B., xv., pp. 52, 373, (1846); *id.*, Cat. Mus. As. Soc., p. 239; Ball, J. A. S. B., xxxix, pt. 2, p. 32; *id.*, Str. Feath., i., p. 82; Hume, *ibid*, p. 313; *id.*, *ibid*, ii., pp. 276, 499; *id.*, Cat. No. 803, Oct.; Hume and Marsh., Game B., i., p. 119; iii., p. 428; Oates in Hume's "Nests and

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Eggs," 2nd Edit., iii., p. 449; Ogilvie-Grant, Cat. B. M., xxii. p. 447; Blanford, Fauna of B. I. Birds iv., p. 147; Sharpe, Hand-List i., p. 12; J. H. St. John, Journal, Bom. N. H. S. xii., p. 213; Butler, *ibid*, p. 689; Oates, Cat. Eggs B. M., i., p. 15; Ogilvie-Grant, Game B., ii., p. 165; Oates, Game B. of In., i., p. 384; Le Mess, Game, Shore & Water Birds, p. 112.

Megapodius trinkutensis.—Sharpe, Ann. Mag. N. H., xiii., p. 448; Hume, Str. Feath., ii., p. 499.

Vernacular names.—Kongah (*Nicobarese*).

Description—Adult Male and Female.—The feathers of the nape, the sides of the head, and surrounding the posterior portions of the crown greyish; chin and throat sparsely feathered with pale grey, sometimes rufescent, sometimes albescent. Remainder of plumage rufescent brown, generally darker above than below. The lower plumage is often a rufous grey, in a few cases becoming almost a pure grey.

The general tone of the upper plumage is usually rather a bright rufescent, but is occasionally duller and rarely has a somewhat olive tinge.

The feathers round the neck are generally sparse, and this part is often nearly bare, and in some specimens the feathers of the head are also much abraded and knocked about.

Ogilvie-Grant remarks about this species in a foot-note in the British Museum Catalogue (*in loc. cit.*):

> "Some specimens as has already been remarked by Lord Tweedale have a curious tendency to lose the feathers on the crown and assume a naked callosity. In a female adult from Nancoury I. the crown is entirely naked, and covered with a thick black-looking skin, which appears almost of the nature of a scab. The same peculiarity is almost equally developed in an immature male from Camorta; while in three other specimens (both adult and immature) the crown is partially denuded, and the skin is of the same black colour. In all the other specimens the skin of the top of the head is red."
>
> "I am of opinion that the naked head in the above-mentioned specimens is abnormal, and possibly caused by disease."

The sexes are alike in size, but vary a great deal individually. Hume gives the following dimensions for a series of fifteen birds, and also notes the colouring of the soft parts:—

> "Length, 14·5 to 17; expanse, 28·0 to 32·5; wing, 8 to 9·5; tail "from vent, 2·75 to 3·5; tarsus, 2·6 to 2·75; bill from gape, 1·2 to 1·3; "bill at front, 0·94 to 1·1; wings when closed, reach to within from 1" to "quite the end of tail; in weight they vary from 1 lb. 5 oz. to 2 lbs. 2 oz."

The above measurements probably include a large proportion of not quite mature birds, and I find that in the British Museum Collection of close on fifty skins no adults have a wing under 9·0" (228·6 mm.) and they run from this up to 9·8" (248·9 mm.) males and females alike being of the smallest and biggest sizes. The other measurements of these birds all come within those given by Hume. Richmond records the total length of the males as

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between 381 and 400 mm., and the females between 374·5 and 409·5 mm., and the weight of females from 30 to 36 oz.

Colours of the soft parts.—"Legs and feet; front of tarsus dark horny, in some greenish horny, scutæ often irregularly marked with lighter horny, front of toes darker, darkening still more towards claws; claws dark horny above, lighter horny beneath, and tipped light horny; soles pale carneous, sometimes pale yellow; tibio-tarsal articulation. back and sides of tarsi dull brick or litharge red. Bill light greenish or yellowish horny, yellower along the edge of mandibles; lores and whole orbital and aural region, and visible portions of the skin of the neck, showing through between the sparse feathers, varying from a light, somewhat cherry red to a bright brick red; irides light brown or hazel brown." (Hume.)

Richmond gives the colours of the soft parts as follows:—

"Eyelids red; sides of head vermilion; skin of throat pale mauve pink; iris clear brown; bill greenish horn; legs dull reddish, brown in front; soles dull ochraceous, claws black." (Proceedings, Nat. Mus. U. S. A., Vol. XXV., p. 311.)

Birds not quite adult have the head and neck completely clothed in feathers, those on the chin and foreneck being greyish white. It seems also that in such birds the under parts are always brown or rufous brown with no tinge of grey.

"The quite young bird, when rather less in size than a quail, is a uniform snuff brown all over, everywhere densely feathered, even about the throat and neck, and with the feathers of the forehead and back of the head much longer, actually and not merely relatively, than in the adult, no bare space in front of or around the eye, no tail developed, only a large bunch of fur-like feathers, but the wings large, strong, and well-formed; the bill very short. One such bird measured 5·5 in length, had a wing of 4″, tarsus 1·1; and bill at front 0·3." (Hume, Str. Feath.)

Distribution.—The Nicobars, where they have been found on every Island except Choura, and Car Nicobar. Butler has recorded them as occurring on Baltye Malve, though Hume and Davison did not find them there. Hume also saw traces of these mounds on Table Island, one of the Andamans, and was told by the European Light-house-Keeper that he had shot birds which he described as corresponding exactly to Megapodes. Oates at a later date went over the same Island together with Captain Shopland, and failed not only to find any trace of the bird, but even of their mounds. Butler also found no traces of birds or their mounds, though he worked this Island very thoroughly.

Nidification.—Davison is quoted by Hume in Stray Feathers, etc., to the following effect:—

"I have seen a great many mounds of this bird; usually they are placed close to the shore, but on Bompoka and on Katchall I saw two mounds some distance inland in the forest; they were composed of dry leaves, sticks, etc., mixed with earth, and were very small compared with others near the sea coast, not being above 3 feet high, and 12 or 14 feet in circumference; those built near the coast are composed chiefly of sand, mixed with rubbish, and varied very much in size, but average about 5 feet high and 30 feet in circumference, but I met with one exceptionally large one on the Island of Trinkut, which must have been

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at least 8 feet high and quite 60 in circumference. It was apparently a very old one, for, from near its centre, grew a tree about 6″ in diameter, whose roots penetrated the mound in all directions to within a foot of its summit, some of them being nearly as thick as a man's wrist; I had the mound dug away almost to the level of the surrounding land, but only got three eggs from it, one quite fresh, and two of which had the chicks somewhat developed.

"On this mound I shot a Megapode, which had evidently only just laid an egg; I dissected it, and from a careful examination it would seem that the eggs are laid at long intervals apart, for the largest egg in the ovary was only about the size of a large pea, and the next in size about as big as a small pea. These mounds are also used by reptiles: for out of one I dug besides the Megapode's eggs, about a dozen eggs of some large lizard.

"I made careful enquiries among the Natives about these birds, and from them I learnt that they usually got 4 or 5 eggs from a mound, but sometimes they got as many as ten; they all assert that only one pair of birds are concerned in the making of a mound, and that they only work at night. When newly-made, the mounds (so I was informed), are small, but are gradually enlarged by the birds, the Natives never dig a mound away, but they probe it with a stick, or with the end of their *dàos*, and when they find a spot where the stick sinks in easily, they scoop out the sand with their hands, generally, though not always, filling in the holes again after they have abstracted the eggs. The Nicobarese and the Malay and Burmese traders take numbers of these eggs, which they generally cook by placing them in hot ashes, but they also sometimes boil them quite hard, and they do not seem to be very particular whether the egg is fresh or contains a chicken in a more or less advanced stage of development. The Nicobarese, at any rate, appear to relish a boiled or roasted chicken out of the egg, quite as much as they do a fresh egg.

"The eggs are usually buried from 3½ to 4 feet deep, and how the young manage to extricate themselves from the superincumbent mass of soil and rubbish seems a mystery. I could not obtain any information from the natives on this point, but most probably they are assisted by their parents, if not entirely freed by them; for these latter, so the natives affirm, are always to be found in the vicinity of the mounds where their eggs are deposited.

"We obtained about 70 of these eggs, 62 of which were preserved; these vary much both as regards colour and size, and they undoubtedly darken very materially by being buried in the sand, for I have found that eggs containing chickens in a more or less advanced stage of development were dark coloured, the depth of shade increasing as the eggs approached the hatching point; but it does not follow from this that all dark coloured eggs will be found to be not fresh, for very often dark coloured eggs are laid. There are three types of eggs—a dull clayey pink, an earthy yellow, and an earthy brown of several shades."

"The surface soil of the mounds only is clay; at about a foot from the surface, the sand feels slightly damp and cold, but as the depth increases the sand gets damper, but at the same time increases in warmth."

Commenting on this account Hume then continues in his own words:—

"I cannot myself agree with Davison about the colouring of the eggs. On the contrary the brighest pink egg we got was one which the bird had not even time to bury before she was surprised. Moreover the

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shells tell their own tale, almost all the small holes in pink eggs and all the largest holes in the brownish ones.

"I saw a considerable number of these mounds, chiefly in Galatia Bay, and there I examined some of them very minutely. These were situated just inside the dense jungle which commences at Spring-tide high-water mark. It appeared to me that the birds first collected a heap of leaves, cocoanuts, and other vegetable matter, and then scraped together sand which they threw over this heap, so as not only to fill up all interstices, but to cover everything with about a foot of pure sand. I say sand, but this term is calculated to mislead, because it does not contain much silex, but consists mainly of triturated coral and shells. After a certain period, whether yearly or not I cannot of course say, the birds scrape away the covering sand layer from about the upper three-fourths of the mound, cover the whole of it over again with vegetable matter, and then cover it over again with the sand. In the large mound, an old one into which I carefully cut a narrow section from centre to margin, this arrangement was very perceptible; in it I thought I could trace by the more or less wedge-shaped portions of pure sand along the base, the remnants of successive outer coverings of sand, the basal portions of which have never been removed, ten or perhaps eleven successive renovations of the mound; even the central portion was perfectly cool. The vegetable matter had in a great measure disappeared, leaving only the hard woody portions behind, but showing where it had been by the discolouration of the sand. The decay of the vegetable matter, and the birds' habit (as I judge from appearances) of not removing the basal portion of the sandy covering at each renovation, sufficiently explain why the mounds increase so much more in radius than in height.

"A smaller mound, as I take it still in use, though I could find no eggs in it, contained a much greater amount of vegetable matter, and was sensibly warm inside. I could make no section of it, as it was too full of imperfectly decayed vegetation. I believe that the bird depends for the hatching of its eggs solely on the warmth generated by chemical action. The succulent decaying vegetation, constant moisture, and finely triturated lime, all combined in a huge heap, will account for a considerable degree of artificial heat.

"I am by no means satisfied that only one pair of birds use the same mound. On the contrary, the Nicobarese I had with me that day, explained, as I understood, that the one pair begin the mound, they and all their progeny keep on using and adding to it for years, and as '*Cuxem*,' or whatever the wretch's sobriquet was, interpreted, the men with us had during the previous month, taken at one time some 20 eggs out of one and the same mound, which also they took us to see, and which was perhaps 5′ high and 16′ or 18′ in diameter, and which was the freshest looking I had seen.

"The eggs are excessively elongated ovals, enormously large for the size of the bird. They vary a great deal in size, and a good deal in shape; all are much elongated, but some are more like turtle's eggs than those of a bird. When first laid they are of a uniform ruddy pink as we know from having obtained one before the bird had even time to bury it; after being buried, so long as the egg remains quite fresh, it continues a pale pink, but as the chicken develops within, the egg becomes a buffy stone colour, and when near about hatching it is a very pale yellowish brown. The whole colouring matter is contained in an excessively thin chalky flake, which is easily scraped off, having a pure white chalky shell below; this outer coloured coat seems to have a

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great tendency to flake off in spots, specks, and even large blotches, as the chicken develops within. Quite fresh laid eggs rarely exhibit any white marks of any kind, while those more or less approaching hatching (one cannot say incubation in this case) are invariably more or less mottled with white. Occasionally fairly fresh eggs are dug out, bearing along their entire length on one side, two parallel white lines made apparently by the claws of the mother bird when scraping the sand over them. The eggs are always a little pointed towards one end, and some, especially the less cylindrical ones, are conspicuously so. The shell is entirely devoid of gloss, and the surface is everywhere roughened with innumerable minute pores which occur equally in the exterior coloured flake, and the white somewhat less chalky shell beneath."

"In length the eggs vary from 3·01″ to 3·4″, and in breadth from 1·90″ to 2·25″, but the average of 62 eggs I have carefully measured is 3·25″ × 2·07″."

Reducing Hume's measurements in inches to millimetres we have a length between 76·4 and 85·3 mm., and a breadth between 48·2 and 57·1 with an average of 82·5 × 52·5 mm.

The question as to whether the old birds pay any further attention to the young after they are hatched is by no means settled. It is true that the young birds have been seen associating with the full-grown ones, but it would appear that the young have been of various ages, as one would expect, and that there have been generally more than two adult birds, which one would not have expected. The young can fly directly they are hatched, for, as already stated, they are born fully feathered, not covered with down, and if sufficiently precocious to fly without being taught, why should they not be sufficiently so to know how to feed themselves also.

Butler says that he thinks the young birds find their way out of the mound unaided by the parents, and remarks :—

"For one thing the birds could never know—with eggs in different stages of incubation in the same mound—when to dig down to save a new hatched young one from suffocation; further, the eggs can be hatched by packing them in a box in the material of the mound in which they are found, and Mr. E. H. Man, who hatched a chick on his verandah by this means, told me that it not only extricated itself from the sand, but flew up on the verandah railing directly it was approached."

The eggs seem to be abnormally tough in constitution, for Lieut. St. John records how some eggs which were taken away in buckets of sand were forgotten, the sand taken away and the eggs left exposed to open air and rain without any protection, yet of the dozen collected some five or six hatched out.

Mr. St. John says that these young ones were fed entirely on white ants, on which they thrived well.

Habits.—Almost the only existing accounts of this bird and its habits we owe to Hume and to Mr. J. Davison, who, for many years, collected for him, and whom every writer on the Megapode has quoted since Volume 2 of Stray Feathers was written. The latter says :

"The Megapode never wanders from the seashore, and throughout the day keeps in thickest jungle, a hundred yards or so above highwater

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mark. It never, so far as I observed, emerged on to the open grass hills that form so conspicuous a feature in so many of the Nicobars, but throughout the day hugged the belt of the more or less dense jungle that in most places, along the whole coast-line, supervenes abruptly on the white coral beach. At dusk during moonlight nights, and in the early dawn, glimpses may be caught of them running about on the shore or even at the very water's edge, but during daylight they skulk in the jungle.

"They are to be met with in pairs, coveys, and flocks of from 30 to 50. They run with great rapidity, and rise unwillingly, running and flying just like jungle hens. They often call to each other, and when a party has been surprised and dispersed, they keep on calling to each other incessantly, half a dozen cackling to each other. The note is not unlike the chuckling of a hen that has recently laid an egg, and is anxious to publish the stupendous fact on nature's pages; it may be syllabled in a variety of ways, but several of us agreed that on the whole 'Kuk-a-kuk-kuk' most nearly represented their chuckling, cackling call.

"The stomachs of all we examined contained tiny land shells, sometimes with the animals not yet dead, larvæ of insects, dissolved matter, apparently vegetables, and minute fragments and particles of quartz and other hard rocks.

"When by any chance you can get up to them they are easy to shoot. They are most abundant where the soil is light and sandy, and the ground at the bases of the magnificent trees that overshadow one from above, is therefore comparatively penetrable, and in such localities, with a few good dogs, they would afford very pretty shooting.

"As game they are unsurpassed. The flesh very white, very sweet and juicy, loaded with fat is delicious, a sort of *juste milieu* between that of a fat Norfolk Turkey and a fat Norfolk Pheasant.

"The eggs, too, are quite equal if not superior to that of the Peafowl, and to my mind higher commendation cannot be given."

A friend writing to me from the Andamans after his first interview with these birds says:

"To me they appear like large and very fat Barn-door Fowls with abnormally small heads compared to their heavy fat bodies, but even these latter were small in comparison to their powerful legs and huge feet. We found it difficult to make them fly, though when they did do so, they went quite a decent pace as soon as they had got fairly started. Curiously enough some quite small chicks we saw were quicker away and actually faster on the wing than the full-grown bird. They all ran at a tremendous pace, heads and sterns held low, like a jungle-fowl on the run, but were even quicker than that bird."

Davison, who saw more of these birds than anyone else, even Hume, never saw more than six birds in a flock, but one of the Convicts told him that he saw about thirty of them together on Trinkut.

Sub-Order—*ALECTOROPODES*.

The principal external feature in which this sub-order differs from the *Peristoropodes* consists in the hind toe being raised above the other three in addition to which it is much shorter, its basal phalanx being shorter than that of the middle or third toe.

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The inner posterior notch on each side of the sternum is more than half the length of the sternum instead of less than half as in the *Peristoropodes*.

FAMILIES.

Ogilvie-Grant divides the *Alectoropodes* into two families, the *Tetraonidæ* and *Phasianidæ*, the former having the nostrils feathered, and the toes naked and pectinate or feathered, whilst the latter have the nostrils clear of feathers and the toes without pectination and not feathered.

An additional character used by him to differentiate between the two families, *i.e.*, the feathering of the tarsus, does not hold good throughout, for though all the *Tetraonidæ* have the tarsi feathered, one species, *Lerwa*, of the *Phasianidæ* also has the tarsus well feathered and a second, *Tetraogallus*, has it partially so covered. In spite of this, however, I consider his diagnosis of the two families the best put forward, so far and when considered together with the general appearance of the birds and their habits, the reasons given appear to be fully sufficient to authorize the division, and I therefore accept the two families.

Of the *Tetraonidæ*, or true grouse, we have no representatives in India, but the *Phasianidæ* are very well represented.

Family—*PHASIANIDÆ*.

SUB-FAMILIES.

When we come to consider in what way the family *Phasianidæ* can, or should, be divided into sub-families, we are faced with a most difficult problem. Jerdon, who like Ogilivie-Grant, divided his game birds into two families, *Phasianidæ* and *Tetraonidæ*, divided each of these again into three sub-families, the first into *Pavoninæ*, *Phasianinæ* and *Gallinæ*, and the second into *Tetraoninæ*, *Perdicinæ* and *Coturnicinæ*. But these divisions are admittedly more popular than scientific, and there is no really definite dividing line between the various groups as formed by him. Ogilvie-Grant, in Game Birds, divides his *Phasianidæ* into two divisions, *Phasianinæ* and *Perdicinæ*, basing his division on two features, (1) comparative length of tail and (2) length of first primary in comparison with the tenth. Neither of these features, however, are consistent, though on the whole they work fairly well. Finally Blanford, in the Fauna of British India, Birds, failing to find any satisfactory reasons for, or method of, division, attempts none, and keeps all the *Phasianidæ* together as one undivided family.

To the Sportsman and Field Naturalists the majority of the game birds form themselves into four fairly definite groups, *viz.*, Peafowl, Argus Pheasants, Pheasants, and Partridges, to which we may

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possibly add the Jungle Fowl as a fifth, for these birds in outward structure and general habits do not seem to agree well with any of the others. Hitherto there has, however, been no sound scientific data discovered upon which it was possible to define these superficially self-apparent divisions, and the large number of genera which could not be placed with certainty have defied scientific classification.

Recently, in July 1914, Beebe has written in "Zoologica," the publication of the N. Y. Zoological Society, a most interesting article on the *Phasianidæ* in which he explains how he proposes to divide this family into four sub-families according to the formula for the moulting of their rectrices. According to this Ornithologist the Partridges (*Perdicinæ*) commence by moulting the central tail feathers and finish with the outermost pair; with the true Pheasants (*Phasianinæ*) the exact reverse obtains; the Argus Pheasants (*Argusianæ*) commence by moulting the third pair from the centre, and the Peafowl (*Pavoninæ*) commence with the fifth pair.

By this classification the Jungle Fowl are included with the Pheasants, an arrangement which agrees with nearly every system hitherto accepted, but one concerning which I cannot but feel doubtful. Beebe says himself that he only puts forward this scheme *faute de mieux*, and frankly adds that he hopes that some still better one may be found to succeed it; he also remarks that he has been unable to examine thoroughly many of the genera he includes in his *Perdicinæ*.

As a whole I accept Beebe's classification; it is the only one which has any scientific basis, and it is convenient from the point of view of the Sportsman and Field Worker.

Key to Sub-Families.

Moult of rectrices commencing—

A.—With the fifth pair ... ... *Pavoninæ.*
B.—With the third pair ... ... *Argusianinæ.*
C.—With the outermost pair ... ... *Phasianinæ.*
D.—With the central pair ... ... *Perdicinæ.*

The above key is, unfortunately, of no use to the Sportsman who may find the following alternative one easier to understand, though it must be confessed that it is not a very sound one scientifically.

A.—Feathers of tail or tail coverts with large metallic occelli.
a. Wing over 15" ... ... *Pavoninæ.*
b. Wing under 15" ... ... *Argusianinæ.*
B.—No occellations.
c. Wing over 8"; tail longer than wing except in *Lophophorus* and *Lophura*... ... ... *Phasianinæ.*

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d. Wing under 8″ except *Tragopan*, *Ithagenes* and *Tetraogallus*; tail much shorter than wing except *Tragopan* in which they are equal. *Perdicinæ.*

Of the two exceptions to this key in the *Phasianinæ*, *Lophorus* and *Lophura* are both big birds with crests and with a wing of over 11″, a combination obtaining in none of the *Perdicinæ*. In the *Perdicinæ* both *Ithagenes* and *Tetraogallus* have the wing very much longer than the tail, and the birds of the genus *Tragopan* in which wing and tail are about equal, can always be discriminated from all others by their peculiar fleshy horns and wattles.

Sub-family—Pavoninæ.

In this sub-family the two species of which it consists commence the moult of their tails with the fifth pair of feathers.

The birds themselves are so well known that no details are required to enable the Sportsman and Field Naturalist to identify them at a glance.

Key to Species.

Crest feathers ending with spatulate, half moon shaped drops ... ... *cristatus.*
Crest feathers pointed at the tips... ... *muticus.*

Pavo Cristatus.

The Common Pea-Fowl.

Pavo cristatus.—Linn. Syst. Nat., i., p. 267 (1766); Lath. Ind, Orn., ii., p. 616 (1790); Sykes, P. Z. S. (1830), p. 151; Blyth. Cat. Mus. As. Soc., Bengal, p. 239 (1849); Jerdon, Birds Ind., iii., p. 506 (1863); Elliot, Monog. Phas., i., pl. III. (1872); Stoliczka, Journ. Asiat. Soc., Beng., xxxvii., pt. 2, p. 67; *id.*, *ibid*, xli., pt. 2, p. 249; Hume's Nests and Eggs, p. 516 (1873); Blanford, J.A.S.B., xxxviii., pt. 2, p. 189; Godwin Austin, *ibid.* xxxix., pt. 2, p. 272; Adams, Stray Feath., i., p. 392 (1873); Hume, *ibid*, ii., p. 276 (1874); Ball, *ibid*, ii., p. 426 (1874); Butler, *ibid*, iv., p. 5 (1876); Fairburn, *ibid*, iv., p. 262 (1876); *id.*, *ibid*, v., p. 409 (1877); Marshall, B. Nest. India, p. 59 (1877); Hume, Stray Feath., vii., p. 67 (1878); Davidson and Wenden, *ibid*, vii., p. 86; Butler, *ibid*, vii., p. 177 (1878); Ball, *ibid*, vii., p. 225 (1878); Hume and Marshall, Game B. India, i., p. 81 plate (1878); Scully, Stray Feath., viii., p. 342 (1879); S. Doig, *ibid*, viii., p. 371 (1879); Wilson, *ibid*, viii., p. 492 (1879); Butler, *ibid*, viii., p. 493; Butler, Cat. Birds Sind., p. 53 (1879); Legge's Birds of Ceylon, iii., p. 731 (1880); Vidal, Stray Feath., ix., p. 75 (1880); McInroy, *ibid*, ix., p. 202 (1880);

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Butler, *ibid*, ix., p. 421 (1880) ; Reid, *ibid*, x., p. 61 (1881) ; Davidson, *ibid*, x., p. 316 (1882) ; Davison, *ibid*, x., p. 409 (1882) ; Taylor, *ibid*, x., p. 464 (1887) ; Hume, *ibid*, xi., p. 300 (1888) ; Oates, ed. Hume's Nests and Eggs, iii., p. 405 (1890) ; Ogilvie-Grant, Cat. Birds B. M., xxii., p. 368 (1893) ; *id.*, Hand-List Game Birds, ii., p. 77 (1897) ; Oates' Manual Game Birds, i., p. 274 (1898) ; Blanford, Faun. Brit. Ind., iv., p. 68 (1898) ; Sharpe, Hand-List Birds, i., p. 61 (1899) ; Oates, Cat. Eggs B. M., i., p. 61, (1901) ; Bourdillon, J. B. N. H. Soc., xvi., p. 3 (1904) ; Ward, *ibid*, xvii., p. 944 (1907) ; Stuart Baker, *ibid*, xvii., p. 971 (1907) ; Finn, Avicult. Mag. (3) i., p. 128 (1909) (Notes on " In Captivity ") ; King, J. B. N. H. Soc., xxi., p. 100 (1911) ; Whitehead, *ibid*, xxi., p. 168 (1911) ; Dodsworth, *ibid*, xxi., p. 1082 (1912).

Pavo assamensis, McClell. Ind. Rev. (1838), p. 513.

Pavo nigripennis, Sclater, P. Z. S., p. 221 (1860) ; Oates, B. of Burm., ii., p. 313 (1883) ; Finn, Avi. Mag. (3) i., p. 128 (1909).

Peacock, Beebe, Avicult. Mag., iii., p. 127 (1905) ; (Display in Captivity) Pocock, Avicult. Mag. (3) ii., p. 232.

Vernacular Names.—Mor, Manjur (*Hin. etc.*) ; Taus, (*P.*) ; Landuri ♀ (*Mahr.*) ; Manja ♂, Manir ♀ (*Uriya*) ; Mabya (*Bhot.*) ; Mong-Yung (*Lepcha.*) ; Moir, Moira (*Assam.*) ; Dode-Yung (*Garo.*) ; Daodi-Yung (*Cachari*) ; Voh-tè (*Mikir*) ; Myl (*Tamil*) ; Nimili (*Tel.*) ; Norol (*Can.*) ; Monara (*Cing.*).

Description—Adult Male.—Feathered portion of the head dark metallic green-blue, gradually changing to brilliant Prussian blue on neck, breast and shoulders, shaded in different lights with green and purple-blue ; lower breast deeper purple-blue, changing again to deep metallic green on abdomen and flanks, and to dull brownish-black on vent, centre of abdomen and under tail coverts. Back from shoulders to rump brilliant light bronze-green, each feather black-edged, those nearest the neck with blue central streaks, and those of the rump with wide sub-edges of metallic golden green. Tail dark brown with paler mottling near the shafts.

Central upper tail coverts, composing the train, bronze-green with a copper sheen near the tips, each feather with an eye formed by a deep blue heart-shaped spot with four rings ; the first a narrow one of brilliant smalt blue-green, the second much broader of golden bronze, then a very narrow one of gold, and finally one of brown. The outer feathers and the longest of the central ones have no eyes, but terminate in a broad half moon. A few of the outer shorter coverts have indefinite occelli of deep copper colour.

Wings ; primaries, their greater coverts and bastard wing, pale chestnut brown ; outer secondaries, and their greater and median coverts, dark brown glossed with deep metallic blue, most pronounced on the median coverts ; inner secondaries, all other coverts and

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scapulars, buff with dark brown bars, definite and glossed with green on the scapulars and coverts next them, broken and with practically no gloss elsewhere.

Colours of the Soft Parts.—Bare portion of the face and cheeks livid white; bill dark horny, darkest at the tip and along culmen; lower mandible paler; iris dark hazel brown; legs and feet greyish brown to dark horny brown; claws still darker.

Measurements.—Total length to end of true tail about 3′-6″; to the end of the upper tail coverts or train 6′ to 7′-6″; wing, 17·5″ to 19·5″ (444·5 to 495·3 mm.); tail 15″ to 18″ (383·0 to 458·2mm.); tarsus 5″ to 5·5″ (127 to 139 mm.); bill at front about 1·6″ (40·6 mm.); and from gape about 2″ (50·8 mm.).

> "Length 80 to 92; to end of true tail only 40 to 46; the train in full breeding plumage projects from 40 to 48″ (and I have been assured even 54″) beyond the end of the true tail; wing 18 to 19; tail from vent 18 to 21; tarsus 5·5 to 5·75; bill from gape 1·9; weight 9 to 11¼ lbs." (Hume.)

A train of one of these birds for many years in the possession of my father was full 5′-3″ in length, but I have seen only one other, that of a male shot in N. Cachar, which approached this in length. The bird from which the above train was taken was shot in Maldap.

Adult Female.—Top of the head mostly dark chestnut, each feather bordered with golden brown, becoming paler on the neck; mantle golden green; remainder of the upper surface brownish, marked and barred with brownish white or buff; primary quills and tail feathers dark brown with paler tips, lower breast and abdomen whitish buff.

Measurements.—Total length to end of tail rather under 3′; wing about 16″ (406 mm.); tail 13″ (330 mm.); tarsus about 4·8″ (103·6 mm.); bill at front about 1·5″ (38·3 mm.).

> "Females: length 36 to 40; wing 15·75 to 16·5; tail from vent 12·75 to 14·5; tarsus 5·0 to 5·2; bill from gape 1·7 to 1·8; weight 6 to 8½ lbs."—(Hume.)

A female shot by me in the N. Cachar Hills weighed full 9 lbs.

Young Males resemble the adult female but have the primary quills pale chestnut, as in the males, but mottled with dark brown.

Young Bird, 9 weeks old.—Top of head pale sandy with black bases to the feathers; crest about half an inch long, black at the base, brownish chestnut on the terminal half and tipped with black; general colour of the upper parts, including the wings and tail, light brown, barred and freckled with brownish black; under surface of the body yellowish white becoming browner on the chest.

Chick in down.—Pale buff with dark brown nuchal mark running from behind one eye to the other and down across the neck; back deeper rufous brown; quills of wing pale dull chestnut mottled with brown, and secondaries barred and mottled with brown and pale tipped.

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The form known as *nigripennis* differs from the common one in having the scapulars and wing coverts black with narrow green edges; the thighs are black and the back is still more golden than in the normal plumage.

There is nothing to prove that the form is other than an abnormal phase, shewing, perhaps, an inclination towards melanism. It is very rare and has hitherto never been obtained in birds in a state of nature. Grant suggests that this form may be a reversion to the original ancestor of all peafowl, but there is no proof of its being an atavism, and it appears to me that some tendency to melanism is a more likely cause.

Albinoism is very common, even in a wild state, many such birds having been shot, whilst in a domestic state the form has become a permanent one, breeding true with great regularity.

Distribution.—Practically the whole of India proper and Ceylon with the exception of the Trans-Indus in the North-West and the extreme North-East of the Empire next to Burmah.

In Sind it is now common, though not indigenous, and it is equally so in Rajputana, Cutch and Guzerat. It is never found in the greater part of the Sunderbands in Eastern Bengal, but it occurs rarely in the district of Mymensingh and in Barisal in the low-lying forest bordering the sea coast and tidal rivers. In the 24 Parganas, Nadia and adjacent districts, it does not now exist, but probably did so at one time except in the most swampy parts. It used to be comparatively common in the Santhal Parganas and many districts in West Bengal, but is undoubtedly becoming less so year by year.

In Assam it is found on both sides of the Brahmapootra River North and South, but the watershed of the mountains on the South would appear to be its boundary in that direction. It is *very* common in the Garo and Mikir Hills, common in the north of the North Cachar Hills, and thence extends along the north of the Khasia Hills and the various Naga Hills as far as Sibsagar and Dibrugarh, becoming more and more rare as one works East.

According to native legends, Peafowl were once common in Manipur, and I have heard of its being shot in the early nineties by some sportsmen North-East of Imphal, but presumably these birds, if they ever did exist, were of the Burmese form. In Cachar and Sylhet, south of the watershed, it does not occur, but I have heard of its being shot in Commilla and the Tippera Hill States, though here again the bird is more likely to be the Burmese than the common Peafowl as the latter form certainly does extend into the south of the Looshai Hills and Chittagong Hill Tracts.

In Travancore Bourdillon says it is becoming more and more rare, and the Peafowl would appear to be one of those birds which increase enormously directly the slightest protection is afforded,

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but has a tough fight for existence under less favourable circumstances. In all the lower hills in the N. of the Khasia Hills it is said once to have been common, but with the exception of the Kopili Valley has now almost disappeared.

Nidification.—The breeding season of the Peafowl varies greatly in the different parts of the area it inhabits. In Ceylon Legge states that the principal breeding season is from January to April; all along the foothills of the Himalayas from Assam to Nepal it appears to lay principally in the months of March and April, but elsewhere, according to numerous observers, it does not commence breeding operations until the rains break, that is to say, about the middle of June, continuing up to the end of August or September. Even in the Central portions of India, however, it appears to be very erratic, for whilst Wilson says that in the Central Provinces he found it breeding in April and May and McInroy also found it breeding during the former month in Hansoor, Davidson, on the other hand, found it breeding in West Khandesh as late as October. Presumably its breeding is governed to a great extent by the rainfall, and in places where there are showers in the early part of the year and food is plentiful, the birds breed from January to April, whereas, when there is a very long period of draught, and in consequence food is very scarce, the birds do not breed until the rains commence and food, both insect and vegetable, is once more abundant. It is difficult to say what is the Peafowl's favourite kind of country for breeding purposes, for over so much of its habitat it is regarded as more or less sacred, and is really in an almost semi-domestic state, and will lay its eggs in any convenient place. Thus, in Rajputana and in other States where they are preserved, they will deposit their eggs in any patch of jungle, grove, or cluster of bushes, quite close to villages, and in the centre of cultivation; or, if other cover is not available, they will make use of thick high crops, such as sugarcane, dhal, etc.

In countries in which it is not held in reverence it is a shy bird, only breeding well away from the haunts of man, and the two conditions which would appear to be then essential are dense cover, thorny if possible, and the propinquity of water.

In N. Cachar, and similar foothills along the mountain ranges South of the Brahmapootra River, its favourite breeding haunts are in forests growing alongside hill streams in which the undergrowth consists of *Bér* bushes and thorny creepers. The *Bér* bushes grow some 10 or 12 feet apart, having little foliage for the first 4 or 5 feet, above which they spread out into table-shaped tops which meet one another and form a dense flat mass. This sort of cover allows Peafowl and other small living creatures to move about in its shade with the greatest ease, whilst to man and the larger animals, movement at any speed is impossible. In country such as this I generally found the nests placed in broken ground, small ravines or sloping

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banks at the foot of one of the *Bér* bushes. Concealment was not attempted, though the masses of fallen leaves which covered the ground were of much the same colour and size as the eggs, so that care in this respect was hardly necessary. Sometimes the eggs were laid on the ground with no real nest other than the fallen debris which had accumulated thereon, but once or twice I found that the natural hollow which had been selected to receive them had been wellfilled with a mass of leaves, small sticks and grass, some of which must have been brought from a considerable distance.

Higher up in the hills, in the open oak forests, the birds were much more particular in selecting nesting places well screened from view. In April, after the grass had all been burnt, the country hereabouts much resembled an endless English park; mile after mile of rolling hill covered with brilliant green grass, amongst which the black stems of numerous oaks stood out in vivid contrast. From a distance the whole plateau looked as if natural cover was non-existent, but on closer acquaintance one found tiny nullahs and rivulets running between the swelling hills, each bank well covered with bushes, tall reeds and brambles, amongst which the Peafowl found all they wanted in the shape of protection. Here too the nests were often much better made as well as better hidden. I found one such which was made of a dense layer of sticks filling up the base of a large natural hollow; above this again there was a well matted covering of coarse grass, whilst the four eggs it contained were half buried in small leaves and finer grasses.

I also once found a nest, from which the young had been hatched, placed in a tangle of creepers and fallen rubbish on the top of a low bush, but Anderson found them in even queerer places than this. He writes (*vide* Hume):

> "Three years ago, a chuprassy, who, from long practice had become somewhat arboreal in his habits, brought me three fresh eggs from an old nest of *Gyps bengalensis*. Shortly afterwards I saw the nest, which was situated on a huge horizontal bough of a burgot, in the centre of some dhak jungle, and on which all the Peafowl in the neighbourhood were in the habit of roosting. I have every reason to believe my chuprassy, because he had no object in wishing to deceive me, and my own experience is in favour of these birds laying at high elevations, for I have on several occasions taken their eggs from the roofs of huts in deserted villages, from high mounds, and from the top of *pucca mujids*, on which rank vegetation grew to a height of 2 or 3 feet."

Professor Littledale, also, writing from Baroda records that there, when the flat country gets flooded, the Peafowl resort to big trees for nesting purposes, and he obtained three fresh eggs which had been laid in a hollow formed by the bifurcation of several massive branches of a Banyan tree.

Hume says:—

> "Canal banks fringed with trees and traversing rich cultivation are their especial delight, and in such localities I have found a great many nests."

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The number of eggs laid by the Pea-hen is generally 3 to 5 sometimes 6, but very rarely more. 8 was the largest clutch ever found by Hume, whilst Marshall, Anderson and others never took more than 6. Personally, I have never seen more than 5 in a nest, and have taken 3 and 4 highly incubated. Miss Cockburn certainly declared that they lay from 10 to 15 eggs in the Neilgherries, but much of her information was evidently obtained from natives, and not first hand, and no other observer in these hills has corroborated her statement, which may, I think, be dismissed as quite incorrect.

The hen sits fairly close when the eggs are nearing hatching, but at other times sneaks quietly away before she is spotted, and the silence with which she will move away amongst dried leaves and rustling grass is very striking, especially when compared with the noise and fluster she creates when suddenly startled.

Hume describes the eggs as—

> "Typical Rasorial ones, much like gigantic guinea-fowl's eggs, with thick, very strong and glossy shells, closely pitted over their whole surface with minute pores."

In colour they vary from a very pale cream or fawn to a warm buff or *café-au-lait*, the majority being a rather decided, though pale buff or cream. Occasionally one comes across eggs which are freckled with a colour the same as, but darker than, the ground colour, and I have one egg in my collection which is mottled all over with a dull grey which makes the egg look as if mildewed. Hume also mentions eggs freckled with reddish brown as thickly as those of the Monal, but such eggs are very exceptional. In shape the eggs are broad blunt ovals, with both ends almost the same, though they vary a good deal, and I have seen one clutch of eggs almost as peg-top shaped as a Plover's.

I have no eggs bigger than the biggest in the Hume collection, which measure 3″ (=76·2 mm.) in length, and 2·2″ (=58·9 mm.) in breadth, but I have a remarkable clutch from the Khasia Hills of which the five eggs average only 2·5″ (= 63·5 mm.) × 1·8″ (= 45·7 mm.), and of which the smallest is only 2·45″ (= 61·2 mm.) × 1·42″ (= 35 mm.).

Hume gives the average of 40 eggs as 2·74″ (= 69·5 mm.) × 2·05″ (=52 mm.). This is practically the same as the average of the eggs I have had pass through my hands.

Incubation of Peafowls' eggs is said to take 32 to 35 days in England, but is shorter in India, and seldom exceeds 30 days.

The Peafowl is, as is well known, polygamous, his harem consisting of from two to five hens, but he takes no interest in the eggs when laid or the young when hatched, leaving all the incubation and care for the young to the females.

Habits.—Wherever it is found the Peafowl is resident, whether in the plains or in the hills. On the whole it is a bird of the plains

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and lower hills rather than of the higher mountains, and generally keeps below 2,000 feet, though in many places it is found at considerably higher elevations. Thus it has been found in Nepal and the borders of the Sikkim Hills up to 4,000 feet, though it is but rarely met with so high up. Col. Ward records that it is found in Jummu and Kashmir, but does not say at what height, merely remarking that it is confined to the lower hills. In the Neilgherries it ascends as high as 5,000 feet, but keeps lower than this, so far as is known at present, in the other hill districts of Southern India. The greatest height at which it has been recorded is by the late Mr. P. Dodsworth in Simla. This gentleman found it very common in the Dhami Reserve at 5,500 feet, and notes that a pair was seen on the Kalka-Simla Railway near Tara Devi Station at an elevation of 6,050 feet.

It is not easy to write of the habits of the Peafowl in general terms, for there are two distinct birds under this name which, though outwardly the same, vary in character almost as greatly as it is possible for them to do so.

Over a great part of Hindoo India Peafowl are considered sacred birds and strictly preserved by the natives, who bitterly resent any interference with them, so that these birds have been the cause of frequent trouble between "Tommy Atkins" on the shoot and the natives of the villages near where they pursue their sport. Even where the natives do not consider the bird to be actually sacred, there are many parts of India where the bird is venerated to a certain extent, or they are considered lucky and never persecuted. In such places there cannot well be any more confiding bird than the Peafowl, and he haunts the immediate vicinity of villages, feeding openly in the cultivation in the early mornings and evenings, scarcely moving off the roads when disturbed by passers-by, and leading his wives and their families into groves and orchards, or into the low scrub jungle, so often found all round Indian villages, where they may be sought, found, and watched by whosoever will.

But take the Peafowl in his haunts in those parts of India where man, instead of protecting him, takes every opportunity of slaughtering him either for the sake of his flesh, or, to a less extent, for his beautiful feathers, and it will indeed be hard to find a bird more wary or clever in avoiding observation and pursuit.

On the banks of the hill streams which run north from the North Cachar Hills into the Brahmapootra River the bird was by no means rare. On these rivers the usual mode of travel was upon two dug-outs fastened together with a platform of plaited split bamboo, upon which was erected a semi-circular grass hut about 3′ high, running some 10′ or so along the platform. The current of the little river was the only means of propulsion down stream,

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though one man squatted in the bows and another in the stern to guide the craft down the rapids and in amongst the rocks. In appearance there was little to distinguish this floating hut from a couple of logs piled up with drift and rubbish, and, as long as the men sat immoveable, most wild animals and birds allowed a very close approach before taking to flight. Buffalo, when wallowing at the water's edge, would allow us to approach, if the wind was right, within 40 or 50 yards. As a rule when within about a couple of hundred yards they would heave themselves on to their feet and stand with noses high in the air, grunting querulously until they suddenly turned tail and took to ponderous flight.

Deer seldom moved until we were within long shot, and even tiger, leopard, and bison often allowed me to drift slowly down until it was too late for them to escape. Bear and pig, of course, in their usual stolid manner would quietly go on feeding and rooting about until we had glided past and once more disappeared from sight. As regards the Peafowl, however, never, during the many years I lived in N. Cachar, did the birds allow me to approach within gunshot.

Often as we lazily floated down the long stretches of smooth, deep water, which divided one rapid from another, the two boatmen crouching down in the boat and myself seated under the little thatch roof, we would see far away in the distance a party of Peafowl on some grass-covered spit of land running into the stream. When first noticed they were generally busily engaged in turning over the rubbish at the edge of the stream or hunting along the border of the bushes for fallen berries, but before we were within a quarter of a mile they would begin to fidget and crane their necks to get a better view of us. The cocks were always the first to get suspicious, and the alarm would generally start by one of them ceasing his search for food and putting his long neck and head into every conceivable position of enquiry as he tried to make out what the curious object was approaching him; he would very quickly communicate his fears to his male comrades, who would then join him in striking attitudes, though the hens would often still continue to scratch round in the sand. Presently one of the cocks would come to the conclusion that it was inadvisable to risk further delay, whereupon, down would go his head and long train, and he would slink away through the bushes into safety, followed in quick succession by the rest of the flock.

They never sought safety in flight unless we suddenly came round some sharp corner practically on the top of them, but invariably slunk away in a manner which reminded me of some big cat or leopard trying to steal away without being seen.

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After I had learnt their ways I sometimes managed to circumvent them by getting out on to the bank and letting the boat float on to within some 200 or 300 yards of the flock. This was near enough to excite their suspicions and intense curiosity, yet not near enough to frighten them away, and I found the boat so completely occupied their attention that it was sometimes possible to slip round them and get a shot from the opposite direction. Even working it this way, however, I think they had more often than not cleared out before I got past them. A crack of a fallen twig or the rustle of a few dried leaves would have put them on the *qui vive* and sent them at once into the safety of the bushes.

It is wonderful the way a cock Peafowl in all the pride of plumage and gorgeous lengthy train will slip through jungle which one would imagine dense enough to stop his movements altogether with such an encumbrance. He seems to be as sinuous as a snake in his movement, as stealthy as a cat in his tread, and as wary as an old bull bison in watching for foes. On foot a sportsman has no chance of pressing Peafowl hard enough to induce them to rise, but a small dog very quickly flushes them, and the old cocks, and the hens too, will then rise with a tremendous commotion and fluster, sometimes flying well away before again landing and taking to their legs, sometimes flying straight up into the larger branches of the nearest lofty tree.

The flight of the Peafowl is generally alluded to in very contemptuous terms by both naturalists and sportsmen, but, as a matter of fact, once they are on the wing they fly at a very fair pace, and though they make an enormous target, they may be easily missed or tinkered unless a good speed is allowed for. Personally, the first bird I ever fired at I missed clear through underrating the pace he was going at, the second I tinkered, knocking out most of his long train, whilst the third bird I treated as a pheasant, and with success.

Unless one is in want of the long train feathers for any purpose, an adult bird is not worth shooting, for they form poor food, being desperately tough and stringy, and by no means delicate in flavour. Birds of the year are, however, excellent eating, especially when they have fed some time in the mustard fields, when they get very fat and tender.

Peafowl are almost omnivorous in their own diet, and will eat all and any kind of grain, young green crops, insects, small reptiles and mammals and even snakes. They are also much given to swallowing small pebbles and grit, and some young birds which I shot on a river bank had their gizzards full of sand mixed with tiny water snails. The latter they had evidently obtained at the edge of the stream, and the sand may have possibly been picked up with them, though more probably it had been taken as a digestive.

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Wherever Peafowl are found the natives have legends connecting them with tigers and leopards. The cats are always credited with being particularly partial to a meal of Peafowl, and the latter are alleged to be so overcome by curiosity or fright when they see a leopard that they fall an easy prey. There seems to be some grounds for these beliefs, for there is no doubt that the Peafowl, in spite of his wiliness, does constantly fall a prey to the bigger cats. When wandering about in the jungles, I have often come across their remains scattered about in all directions, the bird having evidently formed a meal for either leopard or tiger.

Col. Tytler tells an amusing tale of how, when once he was stalking a Peafowl, he was surprised to find that it was so completely taken up with watching something else that it allowed him to approach quite close to it. Looking to see what the bird was gazing at so intently, he discovered a leopard slowly crawling towards the bird; he continues, according to Hume, "that he had never heard of leopards in the neighbourhood, but his astonishment exceeded all bounds when, on raising the gun, it suddenly threw up both its paws, and shrieked out: 'No, Sir, No, Sir, don't fire,' and the supposed leopard turned out to be a professional fowler. These men had learnt that the easiest way to get near a Peafowl was to pose as a leopard, by which means it was easy to get near enough to shoot it with a bow and arrow."

The call of the Peacock is rather a fine cry when heard in the wilds far from any human habitation, though so penetrating and unpleasant when at close quarters in some farm-yard. It has often been likened to the call of a cat, and is a sort of cross between the sound of a trumpet and the miaou of this animal. They often call on moonlight nights, and sometimes when after a long tramp following a wounded buffalo or gaur we have been caught by night and forced to camp out, I have lain awake listening to these birds. Except for the constant drone and hum of insects the Indian nights are very silent, and the occasional call of some nightgar or other night bird only emphasises the silence which succeeds it. Suddenly with startling loudness the loud "*phi-ao phi-ao*" of a cock Peacock would ring out in the stillness, the call being taken up by bird after bird until the last cries died away in the distance.

They like to roost on high boughs, from which they can have a good look out all round. If in forest they will choose one of the higher trees, but frequently I have known them select a tree well out in the open. One such tree comes very vividly to my mind; a huge pine running up clear of all branches for a good 60′, at which point it threw out three great limbs, upon which many generations of Peafowl had roosted at night. There were no villages within many miles, but round about were a number of small deserted quarries

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from which the Hill Tribes had once taken limestone. Bears had superseded the Khasias as tenants of these places, and afforded me many a good afternoon's and evening's sport, and, as a rule, my way home took me under this pine after twilight had fallen, and night after night, one season after another, I found the branches occupied by a magnificent Peacock and his harem of Pea-hens.

What, however, struck me more than anything else about this tree and its occupants was the fact that once darkness had fallen the birds never took the slightest notice of us, although we passed right under their roosting-place. If the twilight was not yet far advanced, we were always spotted before we got within shot, and the birds were off at once, but if we hid in the grass or bushes adjacent, they would shortly return. First we would hear a low chuckle in the grass by the tree, and a scurry of legs and half-open wings through it, and then an old hen would fly up to her perch, followed by the rest of the harem, and finally their lord and master would also take his place. A few minutes' pushing and shoving, a little craning of necks in the attempt to see whether there was any cause for alarm below, and they quickly settled down to sleep. This is rather contrary to Col. Tickell's experience, for he says :—

> "The cock bird invariably leads the way, rising suddenly from the brushwood near the roosting tree, with a loud 'kok-kok-kok-kok' and being presently followed by his harem—four or five hens. If marked to their roosting-place, and if it be a clear moonlight night, they may be easily shot, for, not knowing where to go, they will frequently remain on the tree until fired at two or three times. When forced to quit, they fly to the ground and pass the rest of the night as well as they can."

Perhaps when the birds go to roost the cock may generally lead the way, but once they have been disturbed, he is always the last to leave cover, and does not do so until the hens have made sure the way is safe. As regards their remaining on the ground all night, this is quite unusual in the places I have seen them where, as already stated, they take but little time in getting aloft once more.

Peafowl nearly always call when disturbed by any of the bigger forest animals, but whilst they merely acknowledge the presence of elephant, bear or deer with a few loud calls, the cat tribe they will continue to abuse and shout at as long as they are within sight, and will sometime follow them from one tree to another for a short distance. I have seen and heard them do this when annoyed at the presence of a jungle cat, and on one occasion two hens followed up their hated foe for a hundred yards, and would possibly have continued their pursuit had they not suddenly caught sight of an even more bitter enemy in my own person.

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PAVO MUTICUS.

The Burmese Peafowl.

Pavo muticus.—Linn. Syst. Nat., i., p. 268 (1766); Lath, Ind. Orn, ii., p. 617 (1790); McClelland, Calcutta Journ., ii., p. 144 (1842); Blyth, Cat. Mus. Asiat. Soc., p. 239 (1849); Jerdon, Birds of India, iii., p. 508 (1863); Elliot, Monog. Phasianidæ, i., pl. V. (1872); Hume, Stray Feath., ii., p. 481 (1874); Hume and Oates, *ibid*, iii., p. 165 (1875); Blyth and Walden, Cat. Mamm. and Birds Burmah, p. 147 (1875); Hume and Davision, Stray Feath., vi., pp., 425, 520 (1878); *ibid*, VII., p. 455 (1878); Anderson, Bird, W. Yunnan, p. 668 (1878); Hume and Marshall, Game Bird, Ind., I., p. 93, pl. (1878); Hume, Stray Feath., viii., p. 68 (1879); Bingham, *ibid.*, ix., p. 195 (1880); Fasson, *ibid*, ix., p. 202 (1880); Oates, *ibid*, x., p. 235 (1882); Hume, *ibid*, xi., p. 300 (1888); Oates, Birds Burmah, ii., p. 312 (1883); Ogilvie-Grant, Cat. Birds B. M., xxii., p. 371 (1893); *id.*, Hand-List Game Birds, ii., p. 82 (1897); Oates' Manual, Game B., p. 280 (1898); Blanford, Faun. Brit. Ind., iv., p. 70 (1898); Sharpe, Hand-List, i., p. 40 (1899); Oates, Cat. Eggs Brit. Mus., i., p. 62 (1901); Hopwood, J. B. Nat. Hist. Soc., xviii., p. 433 (1908); Harington, *ibid.*, xix., p. 309 (1909); Hopwood, *ibid.*, xxi., p. 1214 (1912); Gyldenstolpe, Birds, Swedish Ex. to Siam, p. 65 (1913); Gairdner, Journal N. H. Siam, i., p. 40; Barton, *ibid*, ii., p. 108 (1914); Finn, Avicult. Mag. (3) i., p. 129 (1909); Harington, B. of B., p. 119 (1909).

Pavo japonensis.—Bonnat, Table Encycl. Méth., i., p. 179 (1791).

Pavo javanicus.—Horsfield, Trans. Linn. Soc., xiii., p. 185 (1821).

Pavo aldrovandi.—Wilson, Illust. Zool., pls. XIV-XV. (1831).

Pavo spicifer.—Shaw and Nodder, Natur. Miscell., xvi., pl. 641 (1806); Schinz, Nat. Vög., p. 150, pl. 73 (1853).

Vernacular Names.—Doun, Udun or Udaung (*Burmese*); Marait (*Talain*); Tusia (*Karen*); Bourong marah (*Malay*); Pegu-majura (*Bengali, Calcutta*).

Description—Adult Male.—Head from forehead to nape, lores, chin and throat brilliant metallic blue-green, with a purple sheen in some lights; neck and extreme upper breast and mantle golden bronze, the centre of each feather deep purple-blue, bordered with verdigris green and obsoletely fringed with the same. On the neck the blue centres are hidden, but on the upper mantle they shew prominently, and on this part the feathers are boldly fringed with black. Back brilliant emerald green, each feather edged with black, and centred with bronze.

Below, the breast is bronze, each feather edged with deep blue-green and centred with the same; remainder of lower parts and

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flanks duller, deeper green fading to dull brownish black on the centre of the abdomen, vent and undertail coverts.

Wing coverts next the scapulars bronze green with deep blue centres and dark margins; other coverts deep metallic blue-green, changing to copper bronze on the coverts of the inner secondaries; bastard wing greater coverts and primaries light chestnut, with dark brown shafts and tips; secondaries dark brown with metallic green lustre on the visible portions. Tail dark brown with paler mottlings next to the shaft. Tail coverts which form the train similar to those of the Common Peacock.

Colours of Soft Parts.—Naked skin round the eye bluish green, cheeks yellow to pale orange; bill dark horny brown, darkest at the tip and paler at base of lower mandible; legs and feet dark grey brown or horny brown, claws blackish; iris dark brown or deep hazel brown.

"The facial skin is of two colours, smalt blue and chrome yellow.

"The blue runs from a point in front of and below the nostrils, where it is palest, to the gape and thence in a curved line past, and 0·15 in front of the orifice of the ear to within 0·35 of the top of the head, from thence curving round over the eye, and about 0·2 above it, down to the point below the nostrils already referred to; the blue is brightest just behind the eye.

"The chrome yellow extends as a broad irregular band over the posterior portion of the face, immediately behind the blue. It is widest on the cheeks, where it may be 0·8 wide and narrowest at the oral orifice, which it encloses, where it may be 0·45 wide. It begins at the gape and goes as high up as the blue."—(Hume.)

Measurements.—"Length to end of true tail, 40·0 to 48·0; train projects beyond of tail 24·0 to 44·0; expanse 50·5 to 60·0; wing 16·75 to 19·75; tail from vent 15·5 to 17·5; tarsus 5·5 to 6·3; bill from gape 1·95 to 2·05; weight 8·5 lbs. to 11 lbs."—(Hume.)

Hume says that the finest bird of which he has any record was no less than 90″ from the tip of its bill to the end of its train.

Adult Female.—Has no train and differs from the male in the following respects. The whole back and rump is brownish black, more or less barred and marked with buff, the feathers next the scapulars with faint metallic green edges. The feathers of the breast have the bronze and black borders more broken up in appearance. The primaries, bastard wing, and greater coverts are more or less mottled on the outer webs. The upper tail coverts are no longer than the tail and are much mixed with brown and light buff. Tail brown with narrow bars and tip of paler brown.

Measurements.—The female is but little smaller than the male, the wings of those in the British Museum being about 17″ (431·8 mm.).

Young Male.—Resembles the adult female, but the feathers of the lower back are greenish bronze, and the upper tail coverts are golden green tipped with bronze. They fall short of the tip of the tail by about 6″.

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The young male soon commences to shew the sexual differences in colouration, but the metallic parts are more bronze and less green than in the adult. The primaries and their coverts remain like those of the female, and the secondaries and their coverts are dark brown with narrow pale bars, the inner webs much mottled with buff. The green part shews as a metallic sheen on the darker markings.

The longer upper tail coverts are mostly a brilliant copper flame colour broken by the narrow buff bars and by faint indications of the green gloss.

The crest, even when of practically full size, is dull coloured and nearly entirely blackish brown.

In the Burmese Peafowl the reflections on the metallic parts vary very greatly in different lights, in some the green predominates, whilst in others the deep blue almost alone shews, whilst in certain lights the whole tail looks almost copper coloured.

Distribution.—The whole of Burmah, Siam, Cochin China, the Malay Peninsula, Java, and, very doubtfully, Sumatra. In Indian limits it is only to be found in Chittagong, the Chittagong Hill Tracts and the Looshai Hills, but is extremely rare in all these districts.

It is possible that at one time the Burmese Peafowl extended through the Looshai Hills and Manipur into the N. Cachar Hills, and other suitable hill ranges south of the Brahmapootra.

Between 1880 and 1900 a few birds of this species were to be found wild in the high grass uplands to the north of the North Cachar Hills, but they were probably stock from tame birds which had been imported generations previously. The local Mikir *Mozedar*, or chief, had still two pairs of these Peafowl in 1888-9, and these he told me had been imported from Imphal, the principal town of Manipur. He also said that at that time the Burmese Peafowl was to be found in Manipur and Cachar wherever the country was suitable.

In the Looshai Hills and Chittagong Hill Tracts they are very rare and very local and Mr. Sneyd Hutchinson who, for many years, resided in the latter district, never saw a specimen, though he informs me that a few were still to be found in one or two places in the South-East. He mentions in special the two localities, Gurunia and Ramoo, which are amongst those enumerated by Fasson in "Stray Feathers."

Nidification.—There is very little on record about the breeding of this magnificent bird. I had some eggs brought in to me on the 21st May 1888, when camping in the Mikir Hills on the Kopili stream, and, going out at once, saw the nest from which they had been taken, and shot the male bird which was in the scrub jungle alongside the nest. This, the nest, consisted of a large mass of reed blades, grass and leaves chucked carelessly into a hollow between

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the buttresses of an enormous Cotton Tree. The nest was underneath a dense thicket of thorny bushes and impossible to get at without almost lying on the ground or else cutting away the jungle.

The country all round was more or less open grass land, the grass at this time of the year being only about 2 feet high, though by the end of the rains it grew to a height of 4 to even 6 feet. Here and there in the pockets were small patches of forest and scrub jungle, whilst dotted about over the whole uplands were fine oak trees, and wherever a stream ran, its banks bore a strip of evergreen forest on either side.

Mr. K. G. Gairdner records finding numerous eggs of the Peafowl in Ratburi and Pechaburi, Siam, and Mr. Barton writing of the birds of the Rahong District, Siam, quotes Mr. Keddie to the following effect :—

> "On April 9th, 1912, found a Pea-hen's nest with three eggs, chicks half formed. On 18th March 1913 heard a Pea-hen and chicks on an island. Maung Hpo Loke said he saw them, and they were about a fortnight old. He did not know how many there were, but he saw two."

Blandford records the breeding season as being during the monsoons, *i.e.*, the end of June to September near Moulmein and about March near Pegu. It probably extends over most of its habitat from February to May, whilst the majority of eggs will be found in March and April. The number of eggs laid will certainly prove to be about the same as is laid by the Common Peafowl, that is to say, anything between three and six, very rarely more.

Mr. C. M. Inglis, who has been successful in breeding this bird in captivity, sent me four eggs, a full clutch, which were laid in May. I have also the clutch taken in N. Cachar, and have seen half a dozen other specimens laid by wild birds. In the B.M. collection there are unfortunately only four eggs, all of which were laid by birds in Zoological Gardens. These four eggs were between 2·75″ and 3·4″ in length and 2·05″ and 2·15″ in breadth.

The eggs I have measured were between 2·70″ (68·6 mm.) and 3·15″ (80·0 mm.) in length, and between 2·0″ (50·8 mm.) and 2·2″ (55·8 mm.) in breadth.

They are of course indistinguishable from the Common Peafowl's eggs in shape, texture or colour, but the clutch given to me by Mr. Inglis is extraordinarily richly coloured, somewhat like the eggs of a Brahma fowl.

Habits.—Throughout the whole of this Peafowl's range it is a bird of the most retiring, shy disposition, keeping to haunts little frequented by mankind, and shunning even the vicinity of villages in the jungles.

It is a curiously local bird in its distribution, being found in isolated patches here and there with wide intervening spaces where it is never met with, although many parts of it may seem equally suitable to its wants.

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Oates in his "Manual of Game Birds" writes:—

> "The places frequented by these birds are generally well known to the natives, for the birds remain there constantly. In some parts of Upper Burmah this Peafowl is very abundant, and on some of the higher reaches of the Irrawady, above the third defile, large flocks may be seen in the mornings and evenings on the sand banks and shingly margins of the river. I have counted as many as fourteen in one flock. Wherever this bird is found it is extremely shy, and it is not often secured with the shot gun."

Over the greater part of the area in which it is found it is not a common bird, though doubtless its retiring habits and the nature of the cover it frequents may make it appear even more rare than it really is. Even in such places, however, one would imagine its presence could not be concealed, for its loud cry must proclaim it wherever it may be.

Count Guildenstolpe writing of this bird in Southern Siam, declares it to be the shyest bird he met with and by no means common. In Northern Siam it was still more rare, though he sometimes heard them calling, especially in the dry forests near Den Chai and Pak Pan.

Gairdner also speaks of these birds as abundant in Siam, but all my correspondents in Malay and Burmah seem to consider it a rare bird.

It is difficult to say what sort of country it has a preference for. In one place it will be found almost exclusively in elephant grass, in another in open dry forest, and in yet another in the densest thorn and bush undergrowth of evergreen forests. One thing however must be common to all these, and that is the near supply of good and plentiful water. Perhaps on the whole, the haunts to which it is most partial are the banks of the smaller, clear, running rivers, which are well wooded, and which have an abundance of low undergrowth not too dense close to the ground to curtail the freedom of their movements.

Where the rice fields, mustard, and other cultivation encroaches on the jungle, the birds will come into the open in the early mornings and late evenings, but even then it is practically impossible to obtain a shot. They are not only too keen sighted to allow of an approach in the open, but also too sharp of hearing to permit anyone to creep through the jungle to within shot. The crackle of loose branches, and the brushing aside of the coarse grass is quite enough to send them all scurrying into safety. Like the Indian bird, the Burmese Peafowl prefers to trust to his legs rather than to his wings for escape, and he can run at an amazing pace, even when in possession of a full train.

As regards the time during which the train is worn, the evidence is conflicting, but it appears that it is generally acquired during the autumn moult, and is worn until the following spring, when it is

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gradually moulted. Oates himself gives very conflicting views upon this matter. In 1883 in his "Birds of British Burmah," he says that the train commences to grow in February and is lost again by August; fifteen years later in his "Manual of Game Birds," he says that—

> "the train commences to grow at the autumn moult, and by the end of November attains its greatest development . . . and by the commencement of the rains little of the train remains."

In N. Cachar the tame birds, which however lived in a practically wild state, *began* to acquire their train in the October moult, but it was not until January or February that they were at their best. The wild cock I shot in May had a gorgeous train which had only just begun to moult, and was very little frayed or worn.

The cock birds are extremely pugilistic and fierce, and have been quite frequently known to kill each other in their combats and even to kill hens to whom they had taken a dislike. Their display of spreading train, drooping wings and strutting walk is similar to that of the Indian Peafowl, and like that of that bird is used as a means of intimidation as well as of incitement of the hen bird.

Mr. Gairdner in the article I have already quoted records how some tame chicks of his acted:—

> "It was amusing to watch chicks of three weeks' old erecting stumpy tails and lowering wings to intimidate a young Macaque, or a ground lizard; or, when a little older, trying to frighten a woodpecker which had excited their wrath by tapping on dry bamboo poles."

Finn mentions the same fact, and notes that he has seen Peafowl "showing off" prior to attacking a pheasant, and in order to frighten a crow.

It would appear, though this is not yet accepted as proved, that in birds the attitudes assumed by them which are generally known as "showing off" are merely the display of uncontrollable emotion, and may be—indeed often are—caused as much by such emotions as sudden fear, intense anger, etc., as by the anxiety to attract the female.

(*To be continued.*)

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SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY.

By Oldfield Thomas, F.R.S.

No. XI.

A.—On Pipistrels of the Genera *PIPISTRELLUS* and *SCOTOZOUS*.

BY

Oldfield Thomas.

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In the course of determining the bats received in recent consignments from the Bombay Survey I have found the following Pipistrels to be new or worthy of note :—

Pipistrellus shanorum, sp. n.

Closely allied to *P. ceylonicus* but skull smaller and p^1 less developed.

External characters quite as in *P. ceylonicus*, apart from the slightly smaller size. Colour as in the dark forms of *ceylonicus*, such as Southern Indian specimens representing the sub-species *indicus*. The upper surface dark warm brown, the proximal three-fourths of the hairs more blackish; undersurface smoky brown, the hairs broadly tipped with dark buffy or cinnamon.

Skull as compared with that of *ceylonicus* smaller, with smaller, lower brain-case and narrower muzzle. Teeth as in that species except that p^1 is much smaller, only about two-thirds the area of i^2, so that a line drawn from the inner edge of m^1 past that of p^1 continues forwards to that of the canine without touching the minute p^1 between. Lower teeth as in *ceylonicus*.

Dimensions of the type, the italicized measurements taken in the flesh :—

Forearm 37 mm.

Head and body 57, *tail* 30, *ear* 13, tragus on inner edge 4, breadth 2·1; third finger, metacarpal 36, first phalanx 15; fifth finger, metacarpal 33·5, first phalanx 8; lower leg and hindfoot (c.u.) 20·5.

Skull, greatest length 14·5; median length 12; condyle to front of canine 13·6; zygomatic breadth 10; constriction 3·9; breadth of brain-case 7·6; palato-sinual length 5·4; front of canine to back of m^3 5·5; front of p^4 to back of m^2 3·5.

Hab.—Northern Shan States. Type from Pyaung-gaung, 2,800′.

Type.—Adult female. B. M. No. 14. 7. 8. 6. Original number 2963. Collected 4th May 1913 by G. C. Shortridge. Presented by the Bombay Natural History Society.

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Although the skull of this species is similar to that of members of the *P. mordax* group in many respects, it shows its relationship to *P. ceylonicus* by its broader and stouter build, the facing of the cup-shaped outer incisors more outwards and the hiding by this tooth of a larger portion of the inner one when viewed from outside. The brown instead of black colour and the normal-shaped instead of extra broad tragus are also as in *ceylonicus*.

From *ceylonicus* it is distinguishable by its smaller skull, shorter tooth-row, and smaller p^1. Possibly it may hereafter be connected by intermediate links with that bat, and will then form a Burmese sub-species of it, but at present the great geographical gap and the difference in p^1 demand provisional specific distinction.

Pipistrellus ceylonicus subcanus, sub-sp. n.

As in true *ceylonicus*, but general colour greyer and the hairs of the back with hoary grey tips. Undersurface also lighter grey.

Forearm of type 38 mm.

Skull, length 14·7. Front of canine to back of m^3 5·6.

Hab.—Kathiawar and Cutch. Type from Yalala, Junagadh State, Kathiawar. Alt. 200′.

Type.—Sub-adult female. B. M. No. 13. 8. 8. 30. Original number 1840. Collected 28th October 1912 by C. A. Crump. Presented by the Bombay Natural History Society.

The specimens of *P. ceylonicus* prove to be divisible into several local races by slight differences of size and colour. Typical *ceylonicus* of Ceylon is small and dark, *indicus* of S. W. India (Mangalore, Coorg, &c.) is large and dark, while specimens from Bombay are small but of intermediate colour. For these latter the name *chrysothrix* is available, as there is little doubt that Wroughton's *P. chrysothrix* was founded on a specimen of *P. ceylonicus* with abnormal incisors. Something of its ruddy colour is also found spasmodically among the series of *P. ceylonicus*. Many more specimens from all localities will be needed before the colour races can be fully worked out, but it is evident that this greyish race of the north-west, like the corresponding one of *Scotozous dormeri*, should have a special sub-specific name.

Pipistrellus babu, sp. n.

The North Indian representative of *P. tralatitius*. First incisors with scarcely any trace of secondary cups.

Size and general characters as in *tralatitius*. Ears and tragus about as in that species, the tragus of medium length and breadth, its inner margin straight or slightly concave. Wings to the base of the nose. A distinct post-calcarial lobule present. Penis of medium length, its bone well developed, though far shorter than that of *P.*

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abramus, about 6 mm. in length, straight, the proximal end thickened and grooved, its tip forked, but the prongs quite short, much shorter than in the otherwise similar bone of *P. tralatitius*.

Skull in size and shape similar to that of *tralatitius* except that the muzzle is rather flatter, with a more or less well-marked groove along its middle line above. Basial pits rather deeper.

Basal third of interfemoral unusually well clothed with fur above. Colour above dark sepia brown, in some specimens more cinnamon brown, especially posteriorly; the tips of the hairs greyish or paler brown. Undersurface rather but not conspicuously lighter; inguinal region not specially whiter.

First upper incisor with scarcely a trace of the secondary posterior cusp, which is usually present in Pipistrels, and well developed in all the specimens examined of *P. tralatitius*. Outer incisor about three-fourths the height of the inner one. Small anterior premolar about equal in area to i^2, wholly internal, filling up the angle between the canine and p^4, visible from outside.

Dimensions of the type:—

Forearm 35 mm. (other specimens 33 and 34 mm.).

(A spirit ♂ measures, head and body 46; tail 36; ear 11·5; tragus (inner edge) 3·7 × 2·2; forearm 33·5; third finger, metacarpal 32, first phalanx 12·7; fifth finger, metacarpal 30, first phalanx 7·8; tibia 12·3; hindfoot 6·4).

Skull, greatest length 13·4, median length 11·4, condyle to front of canine 12·5, constriction 3·6, mastoid breadth 7·8, palato-sinual length 5·1, front of canine to back of m^3 5, front of p^4 to back of m^2 3·2.

Hab.—Northern India and Lower Himalayas. Type from Murree, 8,000′. Other specimens from Gharial (Dunn), Masuri (Hutton), Simla (Dodsworth), Kumaon (Crump), Nepal (Hodgson), Darjiling (Blyth), Sylhet (Prinsep), Central Provinces (Crump).

Type.—Adult female. B. M. No. 7. 11. 21. 2. Original number 223. Collected 6th September 1907 and presented by Maj. H. N. Dunn, R.A.M.C.

This Pipistrel is recognisable among Indian species by the size of its skull, smaller than that of *P. ceylonicus*, larger than that of other members of the group forming Dobson's and Blanford's "*Vesperugo abramus*". From true *abramus* of China and Japan it is separable by its moderate sized penis, and from the Malay *tralatitius* by the detailed characters mentioned above, notably the almost complete absence of the usual secondary cusp on i^1.

Hodgson's specimens were determined as his "*Vespertilio fuliginosus*" on arrival, but the earlier, typical, specimens sent under that name represent a *Miniopterus*. Hutton, when preparing his classical paper on the Bats of the North-Western Himalayas rightly distinguished this species as new (whence his reference to

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a "specific name") but Peters, who edited his paper, decided that it was "*Vesperugo imbricatus*, Horsf.," by which he meant *tralatitius abramus*, and under this name Hutton's notes appear.* More recent collectors have found the species at various localities throughout Northern India, but I can find no published name which appears to be referable to it.

Pipistrellus paterculus, sp. n.

A small species with a long *os penis* as in *P. abramus*.

Size about as in *P. coromandra*. Ears about as in that species; tragus medium, its inner edge straight or slightly concave, outer slightly convex. Fur rather short, hairs on shoulder barely attaining 4 mm.; those on lower back about the same. Colour above sepia brown, the tips of the hairs considerably lighter than their proximal four-fifths; undersurface brown washed with drab. (One specimen out of six is in a somewhat tawny phase.) Wings to the base of the fifth toe. A well-developed post-calcarial lobule. Penis very large, as large proportionally as in *P. abramus*, and provided with a bone upwards of 9 m.m. in length. This bone, unlike that of *P. abramus*, is practically straight; it is thickened at the base, where there is a grooved surface for attachment, while terminally it is provided with a pair of well-developed prongs turned down at an angle of 45 degrees to the shaft, each prong so bent in at its tip towards its fellow as nearly to complete a ring. No other species of *Pipistrellus* has so large an *os penis* with the exception of *P. abramus*, and in that the bone has a peculiar double curve, and its terminal prongs are far less developed.

Skull without special characteristics, smaller than that of *P. tralatitius*, larger than in *coromandra*. Brain-case rather variable in size. Basial pits shallow and inconspicuous.

Inner upper incisor rather short, with well developed secondary cusp (absent in one specimen); outer incisor rather shorter than the secondary cusp of the inner incisor, its area rather less than that of i^1, p^1 separated from the canine, the fairly developed p^1, which about equals i^2 in area, half internal, well visible externally. Lower premolars subequal in area, the point of the posterior directed more inwards than that of the anterior.

Dimensions of the type, the italicized measurements taken in the flesh:—

Forearm 30 (largest specimen 31·5).

Head and body 45 *mm.*; *tail* 33; *ear* 10·3. Third finger, metacarpus 28, first phalanx 10.7. Tibia 10.5. Foot 5.8.

Skull, greatest length 12·3, mesial length 10.1; condyle to front of canine 11.2; zygomatic breadth 7·8; constriction 3·3; breadth

* P. Z. S., 1872, p. 707.

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of brain-case 6·5; palato-sinual length 4·2; front of canine to back of m^3 4·4; front of p^4 to back of m^2 2·2.

Hab.—Upper Burma. Type from Mt. Popa, other specimens from Mandalay, Kyauk Myaung, Pyaung-gaung, and Maymyo.

Type.—Adult male. B. M. No. 14. 7. 19. 242. Original number 3611. Collected 7th September 1913 by G. C. Shortridge. Presented to the National Museum by the Bombay Natural History Society.

This Burmese Pipistrel is readily distinguishable by its long penis-bone, which rivals that of *P. abramus*, by its p^1 not being wholly crushed inwards out of the tooth-row, and by its i^2 not attaining the height of the outer cusp of i^1.

Mr. Shortridge's later collection from the Chindwin also contains examples of *P. paterculus*, while I now find that the "*Vespertugo abramus*" of my list of Manipur Mammals, 1886. † is likewise the same species.

Scotozous.

It seems advisable to follow Mr. Miller in recognising *Scotozous* as a full genus, thus relieving the large genus *Pipistrellus* of an awkward species which varies in the presence or absence of so otherwise important a tooth as the outer upper incisor. When present the tooth is quite minute, not attaining to the height of the cingulum of i^1.

The specimens of *Scotozous dormeri* tend to divide into two by the greater or less length of the tooth-row, but the difference hardly justifies specific distinction. At the same time, however, there is some colour variation, the great mass of the specimens from the Bombay area being browner, while there are grey forms both to the north-west in Kathiawar, etc., and to the south-east at Bellary. The latter is typical *dormeri*, and the former may be distinguished as a subspecies.

Scotozous dormeri caurinus, subsp. n.

Size, as gauged by skull and teeth, comparatively large. Colour hoary grey.

General colour of type above sepia brown broadly washed with hoary grey, the brown without any tinge of chestnut or cinnamon in it. Undersurface similar but paler, the light ends to the hairs broader and generally whiter, though in some specimens they are deep yellowish.

Skull and teeth larger than in typical *dormeri*.

Dimensions of the type:—

Forearm 36 mm.

† P. Z. S., 1886, p. 59.

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Skull, greatest length 14; median length 11·9; condyle to front of canine 13·7; palato-sinual length 5·4; front of canine to back of m^3 5·6; front of p^4 to back of m^2 3·7.

Hab.—Kathiawar and Cutch. Type from Junagadh, Kathiawar. Alt. 400′.

Type.—Adult female. B. M. No. 13. 8. 8. 32. Original number 2004. Collected 24th November 1912 by C. A. Crump. Presented by the Bombay Natural History Society.

The relations to each other of the larger and smaller forms in the intermediate area will need further investigation, but in the meantime the extreme north-western race may conveniently have a special name.

B.—The Giant Squirrels of Ceylon.

BY

Oldfield Thomas and Robert C. Wroughton.

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Among the collections made for the Survey by Major Mayor in Ceylon, there occur three forms of Giant Squirrel (*Ratufa*) and in trying to assign to them their proper names we find that previous authors have fallen into considerable confusion as to the identification of the different forms described, and their relations to each other. This has been largely due to the fact that the earliest described species has hitherto been practically unrepresented in the National Museum, and efforts to identify it with those in that collection have not unnaturally resulted in error.

The forms we now know to occur are the three following:—

A.—General colour above black, below yellowish, a line along the junction of the two colours grizzled grey. Tail-hairs black with white tips.

B.—Like A., but without any grizzling along the demarcational line and the tail-hairs wholly black.

(In both these forms the general black colour may bleach to rusty brown.)

C.—General colour grizzled grey, only appearing black on the forehead and shoulders. Tail profusely washed with grey.

Taking in succession the names which have been applied to these animals, we have—

macrourus, Pennant., Ind. Zool., I., pl. 1. 1769.

The figure shows a black animal with a grey tail, and on account of this greyness the name has been commonly assigned to C., the most common of the three species, and with a greyish tail, though also with a grey body. Now however that we know of A., we are

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at last able to place the name on a form exactly agreeing with the figure, in body as well as in tail.

ceylonicus, Erxl., Syst. R. A. Mamm., p. 416, 1777, based on the "White-legged Squirrel" of Pennant.

The description would apply to bleached specimens of either A. or B., the tail being said to be "dusky" which neither indicates nor excludes its having had whitish tips to the tail hairs, these whitish tips being little prominent in bleached specimens. The "white" underside, legs, etc., is also nearer the pale buffy of A. than the dark buffy of B. Consequently the universal placing by all writers of *ceylonicus* as a synonym of *macrourus* need not be altered.

ceilonensis, Bodd., Elench. Anim. I., p. 117, 1785.

Based on Pennant's "Ceylon Squirrel", *i. e.*, the animal figured by the latter as *Sciurus macrourus*; therefore A.

tennanti, Blyth., J. A. S. B., XVIII., p. 600, 1849 (misprinted *teanenti*).

Stated to be similar in size and colour to the common large species of the eastern coast of the Bay of Bengal (*i. e.*, *R. melanopepla*), except that the caudal hairs are largely tipped with white.

Therefore A. as described above. Blyth thought C. (which he figured Pl. XXXVI of Vol. XVI) to be the true *macrourus* but as already shown, this is also A.

montanus, Kelaart, Prodr. Faun. Zeyl., p. 50, 1852.

An alternative name for "*S. tennanti*"; again therefore A.

We thus come to the remarkable result that all the five names that have been given to Ceylon Ratufas apply to one form, and that the other two both need new names.

Wroughton's conclusions in 1910† were invalidated by the very incomplete and deceptive character of the material then in the Museum. His "bay" species, *R. m. ceylonica*, was based on old specimens, bleached to a uniform tint, of both A. and B.

The following are descriptions of the three forms now recognised :—

(A.) *Ratufa macroura macroura*, Penn.

Forehead and whole upper surface deep black (when unbleached), but the rump with slight white grizzling laterally. Undersurface, wrists all round, and lower legs, clear buffy, a line along the demarcation on flanks and rump, grizzled black or grey. Nose buffy; crown patch brown; buffy area below ear small. Belly hairs blackish grey basally. Fingers and toes black. Tail with its very long hairs deep black, tipped (except just at the base and sometimes at the end) with white, thus producing the greyish effect shown in Pennant's figure.

† Journ. Bomb. N. H. Soc. XIX., p. 882.

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Dimensions of a female, measured in the flesh by Major Mayor:—
Head and body 336 mm.; tail 366; hindfoot 73; ear 23·5; weight 2 lbs. 6 oz.

Skull, greatest length, 71.

Hab.—Central Highlands of Ceylon. "Found in great abundance at Newera Ellia" (Kelaart). Four specimens obtained by Major Mayor at Pattipola, 6,200'.

(B.) *Ratufa macroura melanochra*, subsp. n.

Upper surface wholly black, without grizzling on rump or along line of demarcation. Undersurface, forearms and lower legs a deeper and more ochraceous buffy than in true *macrourus*, the line of separation very sharply defined. Muzzle tawny. Crown patch pale brown. Area below ears buffy. Fingers and toes black, the black extending to the metapodials. Tail either wholly deep black, or with an inconspicuous buffy line along its centre below; no white grizzling to the hairs.

Dimensions of the type, measured in the flesh:—
Head and body 355 mm.; tail 365; hindfoot 74; ear 26.

Skull, greatest length 70.

Hab. of type.—Kottawa, Southern Province. Alt. 280.' A specimen in the Museum from "Pasdon Corola."

Type.—Adult female. B. M. No. 15. 7. 1. 4. Original number 19. Collected 12th April 1913 by Major E. W. Mayor. Presented by the Bombay Natural History Society. Two specimens.

The chief distinction of this animal from *macroura* is the complete disappearance of the white grizzling from the rump, sides, and tail.

(C.) *Ratufa macroura dandolena**, subsp. n.

General colour above grizzled grey, with an underlying brownish suffusion; a varying area on the shoulders and middle line of rump often black or blackish. Undersurface clear light buff, the hairs generally buffy to their bases. Frontal patch black, contrasting with the general grey colour. Crown patch between ears buffy. Long hairs of ears black, the metectote buffy; a black or blackish line running vertically downwards from the posterior base of the ear. Muzzle and cheeks light buffy, the large dark area between and below eye and ear present in other form usually completely replaced by buffy. Arms and legs cream-buffy, the ends of the fingers and toes only black. Tail black, broadly washed with grey, becoming greyer terminally, and in some specimens almost uniformly grey in its terminal portion; a whitish line along its centre below.

* Singhalese name for the species, *fide* Kelaart and Blanford.

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Dimensions of the type, measured in the flesh :—

Head and body 377 mm ; tail 415 ; hindfoot 71 ; ear 26 ; weight 2 lbs.

Skull, greatest length (c.) 68 mm.

Hab.—Lowland areas all round Ceylon. Type from Wellawaya, Uva Province. Alt. 608′.

Type.—Adult female. B. M. No. 15. 7. 1. 5. Original number 304. Collected 6th July 1913 by Major E. W. Mayor. Presented by the Bombay Natural History Society. About thirty specimens examined.

This squirrel, which would appear to be the common form of the lowlands of Ceylon, is very variable in colour, but may always be distinguished by its grizzled grey body, with which the black frontal patch contrasts strongly, its buffy cheeks, and grey tail. As already explained it is the squirrel spoken of by most previous authors as *Sciurus macrourus*, under which name a recognisable figure of it has been given by Blyth.*

Whether these three forms should be considered species or subspecies is doubtful, but since the differences between *macroura* and *melanochra* are very superficial, and those between *macroura* and *dandolena* are affected by the variability of the latter (No. 347, B.M. No. 15. 7. 1. 6. is indeed distinctly intermediate) we provisionally consider them as subspecies only. Their respective geographical distributions will present an interesting study for naturalists in Ceylon to work out.

C.—The Singhalese Species of Funambulus.

BY

Oldfield Thomas and R. C. Wroughton.

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The Genus *Funambulus* is represented in Ceylon by three well-marked species, of which two are localised in high altitudes while the third is spread throughout every part of the Island, and in consequence varies considerably, forming geographical races or sub-species.

The following is a key to the various forms which, with the aid of the fine series collected by Major Mayor, we have been able to differentiate. True *F. palmarum* does not occur in Ceylon, but is included in the key for the sake of convenience.

Key.

A.—Underside ferruginous ... ... *F. layardi*, Blyth.

B.—Underside brown ... ... *F. kathleenæ*, *nom. nov.*

* J. A. S. B., XVI., pl. XXXVI., fig. 2.

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C.—Underside white ... ... *F. palmarum*, L.
  a. Face more or less bright ferruginous.
    a. All three dorsal stripes buff ... *F. p. palmarum*, L.
    b. At least the median dorsal stripe white.
      a[1]. Median dorsal stripe buffy white, laterals buff... ... *F. p. favonicus*, subsp. nov.
      b[1]. Median dorsal stripe clear white, laterals white or buffy white ... ... *F. p. kelaarti*, Layard.
  b. Face not ferruginous.
    a[1]. Colour paler, central dorsal stripe buff ... ... *F. p. brodiei*, Blyth.
    b[1]. Colour darker, central dorsal stripe white ... ... *F. p. olympius*, subsp. nov.

Funambulus layardi, Blyth.

A markedly distinct species, recognisable at sight by its ferruginous under surface. It would seem to be a trifle smaller than the members of the *F. palmarum* group. Blyth and Kelaart concur in limiting it to the high central part of Ceylon. Jerdon states that it is found in the mountains of Travancore, but we have failed to trace any reliable record of its occurrence outside the Island.

Funambulus kathleenæ, nom. nov.

Funambulus trilineatus, Ryley, Results No. VI., Journ. B. N. H. S, 1914, p. 662.

At the suggestion of Mr. G. S. Miller we have again looked up the question as to whether Kelaart's name, which was evidently first given under a misapprehension, is available for the Ceylon representative of the S. Indian *F. sublineatus*. On the ground that Kelaart in 1852 (Prodr. Faun. Zeyl., p. 54) described the Singhalese form under this name, even though considering it the same as the S. Indian one, Miss Ryley used the name when she gave an account of the differences that distinguish the two forms.

But by the technical rule under which a name, even if without description, receives status by being placed as a synonym of an earlier one, *trilineatus* was not a *nomen nudum* on its first appearance, and could not therefore be used later for another form.

This first appearance was in 1849, when Blyth in discussing *Sciurus layardi* (J. A. S. B., XVIII, p. 602), speaks of "nearly as in *Sc. trilineatus* (vel *Delesserti*)", thus making *triliniatus* a synonym of *delesserti*, which is itself a synonym of *sublineatus*

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Waterh.; the Nilgiri species. The name was therefore unavailable from the beginning for any other form.

This squirrel thus needing a new name, we have applied to it that of Miss Ryley, who first described its characteristics, and to whom we are both so greatly indebted for the assistance she has given in working out the mammals of the Bombay Survey.

We would select as type of the name the specimen described and measured by her, Male, No. 13 of Major Mayor's collection, now B. M. No. 15.7.1.1., collected 11th April 1913 at Kottawa, Southern Province, Ceylon. Major Mayor's second collection contains examples from Ambawela, Uva, 5,030′, and Pattipola, Central Province, 6,210′.

The readiest means of distinguishing *F. kathleenæ* externally from *F. sublineatus* is the much greater breadth of the dark dorsal stripes, which are about 7-8 mm. in breadth, as contrasted with 4-5.

Funambulus palmarum palmarum, L.

Above the hairs are "cream buff" tipped with black, but along the dorsal area "tawny" replaces the "cream buff," thus forming a dark 'saddle' which is broken by three longitudinal lines coloured "cream buff." The face is prominently washed with bright ochraceus. Below dull white. The midrib of the tail (below) bright ochraceous. The feet buffy white.

Unfortunately no properly measured specimens are available, but the hindfoot may be taken as about 36 mm., as measured on six specimens from Madras, presented by Mr. E. Thurston of the Madras Museum. The type locality of this subspecies is Madras (Journ., B. N. H. S., XVI., p. 410).

Funambulus palmarum favonicus, subsp. n.

A smaller form, probably of the size of true *palmarum*. General colour above darker than true *palmarum*, owing to the greater amount of black grizzling. The saddle much darker, the pale colour much darker and richer than in *palmarum*, taking the place of the buff in the grizzling of nape, shoulders and saddle. The central dorsal stripe white, the lateral ones ochraceous buff. Below white. The tail below "cinnamon rufous", *i.e.*, red rather than yellow. Feet a fine grizzle of black and buff.

Dimensions of the type:—Head and body 143; tail 144; hindfoot 33; ear 16.

Hab.—Submontane area of the Southern Province. Type from Udugama.

Type.—Adult female, B. M. No. 15.7.1.2. Original number 47. Collected by Major E. W. Mayor and presented to the National Collection by the Bombay Natural History Society.

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Major Mayor obtained in all 18 specimens as follows:—Kottawa (480′) 4, Udugama 11, Ranna 3. The average of the measurements recorded for these specimens is head and body, 143; tail 140; hindfoot 36; ear 16. When these specimens are laid out in a row their warmer colouring, strong colour contrasts, and grizzled feet differentiate them from the sober, dull coloured *palmarum palmarum*.

Funambulus palmarum kelaarti, Layard.

Size of *favonicus* and general colouring very much as in that form, but all three dorsal stripes white.

Blyth quotes from a letter from Layard (J. A. S. B. XVIII, p. 602, 1849) "at Hambantote I got a new *Sciurus*; like *palmarum*, only the head is much redder, the colour of the back and belly more blended and the animal altogether smaller.* This entirely replaces all the small *Sciuri* in that part of the country: they are first seen at Tangalle, and I fancy extend round to Trincomalee."

The present fine series enables us to say that the form extends not only round to Trincomalee but ranges westwards through the North Central Province.

This is evidently the ordinary lowland form, as distinguished from the submontane *favonicus* on the one hand, and from *brodiei* of the Northern "Palmyra Country" on the other.

The three white (or almost white) dorsal stripes are the most striking character of this form.

Funambulus palmarum brodiei, Blyth.

The form of the extreme north, most nearly approaching true *palmarum* in colouration, but larger in size.

General colour above grizzled pale buff and black, the individual hairs "cream buff" with a black median ring and short black tip. The 'saddle' darker, with "orange rufous" replacing the "cream buff", not extending on to the shoulders. No ochraceous colouring on the face, which with the nape, and shoulders are coloured like the flank. All three dorsal stripes buff. Tail below "orange rufous" (*i.e.*, red rather than yellow).

Feet buff, though very fine grizzling can be seen on close examination.

Type locality—North Ceylon, "the Palmyra District from Puttam to Jafna."

Major Mayor obtained 21 adult specimens at Mannar and Chedikulam, the average measurements of which work out as follows:—Head and body 152; tail 148; hindfoot 37; ear 17.

* We do not know exactly with what form Layard is comparing his new squirrel.

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This form, though larger in size, most nearly approaches true *palmarum* in colouration, but the grey face and shoulders, and above all, the "red" (instead of yellow) colour of the underside of the tail serve to distinguish it.

Funambulus palmarum olympius, subsp. n.

A dark highland form.

Resembling *brodiei* but much darker. The saddle is commonly almost black and the central dorsal stripe paler than the two lateral ones, often white. The lower side of the midrib of the tail is much darker chestnut than in *brodiei*. The feet are darker even than in *favonicus*. Below dull white.

Dimensions of the type :—Head and body 154 ; tail 126 (broken) ; hindfoot 35·5 ; ear 17.

Habitat.—The highlands of central Ceylon, type from Urugalla. Alt. 1,600 feet.

Type.—Adult female. B. M. No. 15. 7. 1. 3. Original number 823. Collected by Major E. W. Mayor on 25th February 1914, and presented to the National Collection by the Bombay Natural History Society.

Major Mayor obtained 30 specimens as follows:—Kandy 6, Urugalla 22, Ambawela 3 and there were already 7 specimens from Kandy in the National Collection. The measurements of the whole work out as follows:—Head and body 154; tail 143; hindfoot 35; ear 17.

Its dark colour distinguishes this race from all the others in the island.

D.—The Ceylon Hare.

BY

R. C. Wroughton.

The type locality of *Lepus nigricollis*, F. Cuv. is "Malabar," but what exactly was understood by that term in 1818 it is now difficult to say. Cuvier quotes from Leschenault's "manuscript catalogue of Malabar Animals," the vernacular name "moussel," a clue which perhaps may enable some member of the Society to locate Leschenault's "Malabar."

There are unfortunately no specimens in the National Collection representing the hare of what we now know as Malabar ; the nearest are the specimens obtained by the Survey from Coorg and until better are available these must be considered to be the typical *Lepus nigricollis*. In this form the dorsal hairs are black with a wide central "ochraceous" band, giving the general appearance of a black and tan grizzle (the tan colouring, unmixed with black, appears again in the forefeet and the upper side of the hindfeet). This black

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and tan grizzle extends only however from the shoulders to short of the rump, on the last three inches above the root of the tail, the ochraceous colouring entirely disappears. From between the ears to between the shoulders is a jet black patch which is continued downwards on each side, forming an almost complete collar. The face between the eyes is coloured like the back. The cheeks, except for a patch below the eye, are grey like the rump.

The Ceylon hare while clearly of the *nigricollis* type, is much paler in colouring than the continental form, a pale buff being substituted for the tan of the back and feet, and the contrast between the rump and dorsal area is very much less marked. The most striking difference however is in the face. The forehead like the back is much paler in the Ceylon animal and the grey cheeks of the Coorg hare wanting; in Ceylon individuals the cheeks are buff and the pale streak through the eye is scarcely noticeable. In some specimens from Dharwar, Kanara, Nilgiris, &c., the characters of the Coorg series are somewhat modified, but the hare of the continent still remains easily distinguishable from what I propose to call

Lepus nigricollis singhala subsp. nov.

Dimensions of the type:—Head and body, 465; tail, 96; hind-foot, 100; ear, 80.

Habitat.—Ceylon. (Type from Kumbukkan, Uva.)

Type.—Adult male. B.M. No. 15.7.1.8. Original number 371. Collected 19th July 1913, by Major Mayor, and presented to the National Collection by the Bombay Natural History Society.

Major Mayor took in all a dozen adult specimens, but all unfortunately from the low country, so I am unable to judge whether those from higher altitudes differ, or to what extent. Kelaart records his belief that the Newera Eliya animal is larger than that from the low country, but notes no other difference.

E.—The Indian Ribbed-faced Deer or Muntjac.

BY

R. C. Wroughton.

The Indian Group of Muntjacs extends through the Malay Peninsula to Java, Sumatra, and the Islands of the Archipelago, as far as Borneo. Only one form of the more Eastern, *i.e.*, Chinese Group, is found within our area, *viz.*:—*M. fecæ* which was taken on Mount Muleyit in Tenasserim. The type, and only known complete specimen, is in the Genoa Museum, but the British Museum has recently acquired a small fragment of the skin of another individual. This species is distinguishable at sight from any other form by its black and white tail.

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In preparing my Report on the Tenasserim Collection, I had to deal with the fine series of Muntjacs contained in it. As there is a local name, *viz.*,—*grandicornis*, Lyd. available, it was necessary to lay out, for comparative examination, all the material in the National Collection, as well as in the Collections of the Mammal Survey. I think I am safe in saying that no student has ever before had so much material to deal with, nevertheless there are still many large areas unrepresented in even this fine lot of material.

The most important missing link is that for Lower Bengal, to which must apply the name *vaginalis*, Bodd. I have all along held the belief that this form would prove to be identical with Hodgson's *ratwa* from Nepal; recently Mr. Shortridge has obtained on the Upper Chindwin two specimens which appear to be identical with *ratwa*, and we may now, I think, fairly assume that the Lower Bengal animal is also identical with that species.

The group proves to be somewhat difficult to deal with, the characters useful for diagnosis being so few. Skull characters which, with only a few specimens to guide one, might have been deemed valuable, are shown by these series to be unreliable. The cheek-teeth are so much wider at the crown than at the base that, as they wear down with use, and are crushed together, the length of the tooth row constantly varies, there being, in some cases, a difference of as much as 10 millimetres between measurements in a young adult and an old animal. The total size of the animal, when tested by exact measurements, taken in the flesh, varies only to a small extent. Differences of colour seem alone to be sufficiently constant to furnish reliable data for differentiation. In the young the colour is lighter than in the old, but the characteristic tint remains constant.

There are certain colour markings which are common to all members of the group, these vary sometimes in degree, usually with age, but are always present. It will be convenient to note these here, so that they need not be repeated subsequently in each detailed description.

1. A black or brown stripe on the front of each horn pedicel, extending downwards on to the face in the male, and corresponding marks on the face of the hornless female.
2. White colouring inside the ears.
3. A pale area on the crown.
4. A "grizzling" on the back of the neck, between the ears and the shoulders, due to a dark ring (or in some cases a dark tip) on each individual hair.
5. A sharply bicoloured tail, coloured like the back above and pure white beneath.
6. A pure white area on the stern, extending downwards, over the inside of the thighs, sometimes even down to the houghs.

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7. A white area inside the forelegs, extending downwards, even to the knee.

8. A white area under the chin and on the upper throat (extending sometimes even to the breast) not sharply defined posteriorly, but gradually darkening into the belly colour.

I have been able to distinguish four forms within our area, which may be arranged in a key as follows :—

A. Grizzling not extending backwards beyond the shoulders.
  a. General colour tawny ochraceous (Tenasserim) ... ... *grandicornis*, Lyd.
  b. General colour bright chestnut (Bengal, Assam) ... ... *vaginalis*, Bodd.

B. Grizzling extending backwards over the back.
  a. General colour ochraceous buff (Dekhan) ... ... *aureus*, H. Smith.
  b. General colour hazel (Coorg) ... *malabaricus*, sp. n.

1. *Muntiacus grandicornis*, Lyd.

1904. *Cervulus grandicornis*, Lydekker. Field, CIV., p. 780.

Size rather large, about the same as in *muntjak* of Java, larger than the Indian forms.

General colour above "tawny ochraceous," rather darker in the centre of the back, below scarcely paler than the flanks. Individual hairs dull pale brown at the base, the basal portion not paler than the rest.

Dimensions :—Head and body, 1,020 to 1,050 ; tail, 180 to 200 ; hindfoot (including hoof) 280 to 295 ; ear, 100 to 105. Skull :—Condylo-basal length, 210 to 215 ; cheek teeth, 56 to 61.

Type locality.—The species was formed on a skull with exceptionally fine horns, the skin was not known until the receipt of these specimens. The skull was obtained by Mr. D. H. Allen, of the Forest Department, in the Thoungyen Forest, Amherst District.

This series of specimens is a very fine one, comprising 20 individuals, of which 7 (♂ 4, ♀ 3) are fully adult.

M. grandicornis extends northwards to the Lower Chindwin but not eastwards to Siam.

2. *Muntiacus vaginalis*, Bodd.

1785. *Cervus vaginalis*, Boddaert, Elench. Anim. I., p. 136.
1833. *Cervus ratwa*, Hodgson, As. Res. XVIII., pt. 2, p. 139.
1844. *Cervus stylocerus*, Wagner, S.S.S. IV., p. 392.

Most unfortunately we have no specimen of the Bengal Muntjac to guide us. The original description says "basal half of hairs white, terminal half brown, the general effect is grey washed with brown" (free translation). This conveys to me a somewhat paler animal than *ratwa*. I have been hesitating for some time over this

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point, but as I have said above the receipt of the specimens from the Upper Chindwin, which so closely resemble *ratwa*, has decided me to accept that species as representative of *vaginalis*. The following is a description of the Nepal animal:—

Size rather smaller than *muntjak* or *grandicornis*. General colour above "cinnamon rufus," the flanks scarcely paler than the back. Below paler. Individual hairs pale at their bases.

Dimensions.—Measurements of size not available, but hindfoot (including hoof) 260 to 270. Skull:—Condylo-basal length, in an adult buck, 187; cheek teeth, 61.

Seven specimens from Nepal examined.

So far as can be judged from the material available *M. vaginalis* occupies Lower Bengal and Nepal spreading through Sikkim to the Upper Chindwin.

3. *Muntiacus aureus*, H. Sm.

1827. *Cervus aureus*, Hamilton Smith, Griff. Cuv. An. King. 8, p. 148.
1844. *Cervus albipes*, Wagner, S.S.S. IV, p. 294.
1873. *Cervulus tamulicus*, Gray. Handlist Mamm. B.M., p. 165.

Size medium.

General colour above "clay colour" tinged with "ochreous," darker in the middle of the back, the grizzling on the back of the neck extending backward along the back. Below still paler. Individual hairs greyish-white at the base.

Dimensions:—Head and body, 975 to 995; tail, 150 to 160; hindfoot (including hoof), 280 to 290; ear, 100 to 105. Skull:—Condylo-basal length, 175 to 180; cheek teeth, 57 to 60.

This species was named on a stuffed specimen from an unknown locality, but the description and coloured plate are unmistakable and could apply to no other species. *C. albipes*, Wagn., was described from "Bombay and Poona." *C. tamulicus* I feel sure was meant by Gray for the next form (or one closely allied to it). He had no actual specimen, but a letter from Elliot describing it as "deep chestnut, becoming browner as the animal grows older." Gray, however, selected a skull and described it. It is still in the National Collection, and is one collected by Sykes in the Dekhan.

I have examined 7 specimens, obtained by the Survey, including ♂ 2, ♀ 2, adult specimens.

M. aureus occupies the Dekhan and extends eastwards through the Central Provinces to Kumaon.

4. *Muntiacus malabaricus*, sp. n.

Size larger than either *vaginalis* or *aureus*, but doubtfully as large as *grandicornis*.

General colour above between "raw sienna" and "tawny" (*i.e.*, "deep chestnut," as described by Elliot, in extract quoted above),

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whole back, and even sides, grizzled. Below drab. Individual hairs white at their bases. Legs very dark, white markings obsolescent.

Dimensions of type :—Head and body, 1,051; tail, 165; hind-foot (including hoof) 285; ear, 101. Skull:—Condylo-basal length, 210; cheek teeth, 54 (60 in a younger skull).

Habitat.—Coorg. (Type from Nagarhol.)

Type.—Old male. B.M. No. 13. 8. 22. 103. Original number, 2575. Collected by G. C. Shortridge, 18th February 1913, and presented to the National Collection by the Bombay Natural History Society.

In addition to the type there are two females, barely adult, also from Coorg. In the Kanara Collection is a specimen which in most particulars closely agrees with *malabaricus*; the legs however are paler, and there is a good deal of white on the inside of the limbs, a character which is obsolescent in the Coorg animal. I thought that this might prove to be an individual variation, but quite recently I have received two skins, in the Ceylon Collection, which are very like the Kanara specimen. For the present I propose to use the name *malabaricus* for all these specimens, but I am quite prepared to find that the receipt of more material from this part of India will necessitate the erection of yet another species or possibly a subspecies.

Mr. Lydekker has kindly allowed me to see the proofs of Vol. IV of his "Catalogue of Ungulate Mammals" dealing with the Muntjacs and I find that he has ranked all the Indian forms as subspecies of the Javan *M. muntjak*. In all the material before me I have been unable to detect any cases of intergrading, and until such are found, I prefer to give all the names specific value.

F.—The Genus Epimys in Ceylon.

BY

R. C. Wroughton.

The following is a list of the names in this Genus recorded by Kelaart, in his Prodromus Faunæ Zeylanicæ :—

1. *Mus decumanus*, Pallas.
2. *Mus rattus*, L.
3. *Mus decumanoides*, Hodgson.
4. *Mus ceylonus*, Kelaart., J. A. S. Ceyl., Vol. II, p. 326*, 1850.
5. *Mus flavescens*, Elliot.
6. *Mus tetragonurus*, Kelaart, J. A. S. Ceyl., Vol. II, p. 330, 1850.

* Note.—The original Journal not being available these references are to the reprint of 1887.

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7. *Mus kandianus*, Kelaart, J. A S. Ceyl., Vol. II, p. 326, 1850.
8. *Mus nemoralis*, Blyth.
9. *Mus asiaticus*, Gray.

Mus rattus and *Mus decumanus*. Miller in his Catalogue of the Mammals of W. Europe, says of these species "Originally confined to the north temperate portions of the Old World; now essentially cosmopolitan through artificial dispersal." Kelaart records both these rats from sea-ports only, no doubt imported specimens. Major Mayor obtained no specimens.

Mus nemoralis, Blyth. The two co-types are in the Indian Museum, Calcutta, but the British Museum possesses a specimen, presented by Kelaart, with identification on the label in Blyth's handwriting, therefore a "metatype." The species is no doubt the Island representative of the Indian *E. rufescens*. *E. nemoralis* would appear to be rather smaller than *rufescens*, with a proportionally longer tail; the skull, so far as I can judge from the fragments available, is longer and narrower. Kelaart records the species from Colombo (type locality) and Trincomalee; Major Mayor took it also at Mannar and Kandy. It is probably generally distributed throughout the Island, except at the highest elevations.

Mus decumanoides, Hodgson. This is most probably the same species as the last. The description is very meagre, but so far as it goes it quite fairly fits *nemoralis*, Blyth.

Mus flavescens, Elliot. As a name this is useless, being preoccupied for a murine from S. America. There is a specimen in the National Collection labelled with this name in Kelaart's handwriting; neither the skull nor the skin are separable from those of the next.

Mus kandianus, Kelaart. There are three co-types thus labelled in the National Collection. One from Newera Eliya exactly corresponds with Kelaart's description, and this (B. M. No. 52, 5, 9, 26) I propose to select as a "lectotype." The other two are quite distinct, and will be referred to again later. This is undoubtedly the Island representative of the animal which in all previous Reports has been listed as "*rufescens* var.," *i.e.*, the white bellied mainland form of *rufescens*. Major Mayor obtained a very long series of this animal numbering some 50 specimens, from a dozen different localities. In size there is some variation, for a great deal of which however age is no doubt responsible, but in colouring the series is remarkably even.

Mus tetragonurus, Kelaart. The type and only known specimen is in the National Collection (presented and labelled by Kelaart), so far as I can see, it differs in no way from *kandianus*. It was no doubt, when dealt with by Kelaart, a dried specimen with the

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vertebræ in the tail (they have since been removed), which gave the tail the quadrate appearance which inspired the specific name.

Mus ceylonus, Kelaart. I have no specimen to guide me, but the description suggests a young individual of *kandianus*, before the adult dress has been assumed. In his Prodromus, Kelaart adds to his description " I have no reason to think it to be the young of the former species " (*i.e.*, of *decumanoides*). So apparently he had himself some misgivings.

Mus asiaticus, Gray. Unfortunately there is no specimen available to show to what animal Kelaart referred under this name; it may possibly have been a *Millardia* to which his description in some ways applies.

Besides these species actually enumerated by Kelaart, he mentions another as follows :—" There is another rat in Newara Eliya of which we do not now possess any specimens, of more slender make, of still longer and denser fur ; of a dark olive brown surface colour on the upper parts. Beneath white, but not so defined as in *Mus flavescens*. After seeing a description of *M. nitidus* of Hodgson, we suspect this is allied to it, if not identical." Two of the three cotypes of *kandianus*, but not the third, the 'lectotype,' seem to represent this form. Major Mayor obtained a series of over 30 adult specimens from Pattipola and Ambawela belonging to this form, which I propose to call

Epimys kelaarti, sp. n.

A highland form of the *rattus* group, characterised by its dark colouring, and long soft fur.

Size about as in *nemoralis* and *kandianus*, but tail on the average proportionally shorter.

Fur long and soft. General colour above more sober than in *kandianus* showing less mixture of fulvous. The individual hairs pale slate colour at their bases with fulvous tips but with a very large admixture of all black hairs. Below dingy white, merging gradually into colour of upperside, with no marked line of separation as usually in *kandianus*.

Dimensions of type :—Head and body, 156 ; tail, 176 ; hindfoot, 32 ; ear, 21.

Skull :—Greatest length, 42 ; condylo-incisive length, 38 ; molars, 7.

Habitat.—Highlands of Ceylon, 5,000-6,000 feet. (Type from Pattipola.)

Type.—Adult male, B. M. No. 15. 7. 1. 7. Original number 952. Collected by Major Mayor, 21st February, 1914. Presented to the National Collection by the Bombay Natural History Society.

Thus there are found in Ceylon :—

1. *E. rattus*, L.

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2. *E. norvegicus*, Erxleben (*i.e.*, *E. decumanus*, Pallas) as visitors brought from Europe on shipping and found sparingly in Seaports, and especially in Dockyards.

3. *E. nemoralis*, Blyth, representing the *E. rufescens*, Gray, of the Mainland, distributed sparsely as a tree rat all over the Island up to 1,500 feet altitude.

4. *E. kandianus*, Kelaart, representing the "White bellied variety" of *E. rufescens*. This is the common house rat of the whole Island from the sea coast up to the highest altitudes.

5. *E. kelaarti*, sp. n. Perhaps most nearly related to *E. nitidus* of the Himalayas, as surmised by Kelaart. A highland form, only found at elevations of 5,000-6,000 feet.

The three indigenous species may be distinguished as follows:—

A. Hair comparatively short.
  a. Underparts ... ...*nemoralis*, Blyth.
  b. Underparts pure white ...*kandianus*, Kelaart.

B. Hair comparatively long, underparts dirty white, the individual hairs with slaty bases ... ...*kelaarti*, n. sp.

G.—A Second Species of *Cœlomys* from Ceylon.

BY

OLDFIELD THOMAS.

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During the preparation of the general list of the Singhalese Mammalia collected by Major Mayor, the skin recorded in the preliminary list of his first collection as "*Leggada hannyngtoni*" has been re-examined, and proves to represent a second species of the recently described genus *Cœlomys*. It has, indeed, a very considerable resemblance to the Coorg Leggad, and the accident that its hindfoot was wrongly recorded as 22 mm., just as in the Leggad, in place of its true measurement, 25 mm., was no doubt largely responsible for the mistake.

The species may be called:—

Cœlomys bicolor, sp. n.

Size, perhaps, averaging slightly less than in *C. mayori*. Fur much more strongly spinous than in that species, the spines 10—11 mm. in length by about 0.4 mm. in breadth. General colour above, lighter than in *C. mayori* owing to the ends of the wool hairs being of a lighter buff, but on the posterior back the colour is darker, from the predominance of the black-tipped spines. Sides clearer grey. Under surface from chin to anus wholly sharply-defined snowy white, the hairs white to their bases; the white ascending

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rather high up on the sides, and enclosing the whole of the fore-limb*.

Hind limbs slaty grey externally, white on inner side; hind-feet dull whitish above. Tail sharply contrasted brown above and white below.

Skull on the whole very like that of *C. mayori*, but rather narrower throughout, the muzzle and braincase both unusually narrow. In correlation with this the frontal projection into the parietals is only 6.3 mm. in breadth, as compared with 7.8 in *C. mayori*.

Dimensions of the type:—Head and body, 104; tail (imperfect); hindfoot, 25; ear, 17.5.

Skull, tip of nasals to back of frontals, 19.2; zygomatic breadth, 12.8; nasals, 12 × 3.2; interorbital breadth, 4.6; breadth of brain case, 11.8; palatilar length, 13; palatal foramina, 5.7; upper molar series, 4.3.

Habital.—Kottawa, Southern Province. Alt. 250′.

Type.—Adult female. B.M. No. 14. 12. 1. 8. Original number 17. Collected, 12th April 1913, by Major E. W. Mayor. Presented by the Bombay Natural History Society.

This species is evidently a lowland hot-country relative of the highland *Cœlomys mayori*, distinguished from that animal by its more spinous fur, sharply defined pure white underside, and narrower skull.

H.—The Common Indian Mongoose.

BY

R. C. Wroughton.

The oldest specific name for this animal is "*mungo*." In Report No. 1, I erroneously stated that Gmelin gave no type-locality for the 1, species, but this was a mistake, for in his Syst. Nat., p. 84, 1787, he writes "Habitat in Bengala, Persia, aliisque Asiæ callidioribus plagis." The specimens in the Bengal, Bihar, Orissa collection of the Mammal Survey are therefore topotypes, and at last we have a firm foundation for dealing with the species. In all 126 specimens of this animal have been obtained by the Survey, fairly distributed over the whole of India, except the extreme North. A comparison of this large amount of material shows that the Ceylon form is sufficiently different to be ranked as a distinct species. The remainder can be divided into four sub-species (geographical races) of *mungo*, and the further material in the National Collection suffices to establish a fifth.

The pattern of the colouration throughout the species *mungo* is a coarse grizzle of some shade of brown and white more or less pure.

* On one side of the single specimen; on the other a narrow band of grey tends down nearly to the wrist.

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This grizzle is on the face, hands, and feet, very fine indeed, but on the back it is very coarse, and only somewhat less so on the belly, where however it is usually obsolescent or entirely absent. In two of the forms there is a distinct 'wash' of ferrugineus on the face and feet, and in one the ferruginous colouring is so strong that the fine grizzling, referred to above, is completely obscured on at least half the face.

These forms may be arranged in a Key as follows :—

A. Grizzle coarser.
  a. Face, feet and tail-tip coloured strongly ferruginous. (Sind). *Mungos mungo ferrugineus*, Blanf.
  b. Face and feet noticeably, but not strongly, coloured ferruginous.
    aa. Under fur buff. (Bengal). *Mungos mungo mungo*, Gmel.
    bb. Under fur white. (Rajputana) ... ... *Mungos mungo pallens*, Ryl.
  c. Ferruginous colouring of face and feet obsolescent or entirely absent.
    aa. Under fur greyish white. (Nimar, &c.) ... ... *Mungos mungo mœrens*, sub-sp. n.
    bb. Under fur buff (Dharwar, &c.) ... ... *Mungos mungo ellioti*, sub-sp. n.
B. Grizzling very fine (Ceylon) ... *Mungos lanka*, sp. n.

Mungos mungo mungo, Gmel.

1782. *Viverra mungo*, Gmelin, Syst. Nat., p. 84.
1792. *Viverra nems*, Kerr., Anim-King, p. 160.
1812. *Ichneumon edwardsi*, Geoffrey, Descr. d'Egypt. II., p. 139.
1836. *Mangusta nyula*, Hodgson, J. A., S. B. V., p. 236.
1841. *Herpestes pallidus*, Wagner. Schreb. Saug. Supp. II., p. 311.

The names *nems*, *edwardsi*, and *griseus* are supported by descriptions too vague to indicate more than that the animal was the large mongoose of India. Three cotypes of *M. nyula* are in the National Collection and agree entirely with these specimens from Bihar, Orissa. The name *pallidus* is a mere renaming of *nyula*.

The under fur is comparatively very sparse. The length of the hairs on the lower back is about 40 mm. They are dirty white with three bands (each 6 mm. wide) and a tip of a hazel colour.

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The average of the dimensions of 6 males and 7 females are as follows :—Head and body, ♂ 390, ♀ 365 ; tail, ♂ 367, ♀ 347 ; hindfoot, ♂ 77, ♂ 71 ; ear, ♂ 81 ♀ 28. Skull of an adult male from Daltonganj, condylo-incisive length, 81 ; zygomatic breadth, 42.

Distribution :—Nepal, and Lower Ganges Valley. A single specimen was obtained at Sohagpur, C. P.

Mungos mungo pallens, Ryl.

1914. *Mungos mungo pallens*, Ryley., Journ. B. N. H. S. XXII, p. 660.

A desert form of mungo, from which it differs chiefly by its longer hair, and much lighter colour.

The under fur very dense, and of a pure white colour. The length of the dorsal hairs greater (50—55 mm.), and the dark rings on the individual hairs wider (8—10 mm.), than in true *mungo*, consequently the grizzling appears coarser than in *mungo*.

The dimensions of the type given by Miss Ryley are as follows :—Head and body, 378; tail, 398; hindfoot, 74; ear, 27. Skull :—condylo-incisive length, 793; zygomatic breadth, 41·1. The receipt of further material however shows that *pallens* is in no way smaller than *mungo*, indeed if averages are to be exactly trusted, it grows slightly larger.

The type locality of *pallens* is Palanpur, but, as Miss Ryley pointed out, it is found all over Rajputana, and more recently the Survey has obtained it from Kumaon.

Mungos mungo mœrens, sub-sp. n.

Under fur normal, buffy white. The length of the dorsal hairs greater than in *mungo*, less than in *pallens* (45·50 mm.) The dark rings on the individual hairs are as in *mungo*, but the colour is very dark brown, almost black ('seal brown').

Dimensions of the type :—Head and body, 392 ; tail, 361 ; hindfoot, 73 ; ear, 27. Skull :—Condylo-incisive length, 81 mm ; zygomatic breadth, 38·5. The same body dimensions of a large male from Berar are : 430. 415. 78. 32. respectively.

Habitat.—The type is from Ganoor, Nimar, but the Survey has also obtained specimens from Cutch, West Khandesh, Berar, and the Central Provinces.

Type.—Adult female, B. M. No. 12. 6. 28. 14. Original number 728. Collected by Mr. C. A. Crump, on 22nd December 1911, and presented to the National Museum by the Bombay Natural History Society.

Mungos mungo ellioti, sub-sp. n.

Under fur fairly copious, bright buff in colour. Dorsal hairs short as in *mungo* (40-45 mm.), buffy white with four dark rings

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and a tip, the lowest ring about 7mm. the others decreasing in width to the fourth (3½mm), their colour the same as, but rather paler than in *moerens*, so that the grizzling appears finer than in any of the other races.

Dimensions of the type:—Head and body, 480; tail, 410; hindfoot, 80. Skull:—Condylo-incisive, length, 81; zygomatic breadth, 43. The similar body measurements of an adult female from Seringapatam are given by Mr. Shortridge as 400. 355. 71. 28 respectively.

Habitat.—The type locality is Dharwar, but Mr. Shortridge also obtained specimens from Mysore and Coorg and the British Museum possess a specimen from Travancore, so that this is no doubt the form found throughout Southern India.

Type.—Adult male, No. 12. 6. 29. 44. Original number 476. Collected by Mr. G. C. Shortridge on the 5th January 1912, and presented to the National Collection by the Bombay Natural History Society.

Mungos mungo ferrugineus, Blanf.

1874. *Herpestes ferrugineus*, Blanford. P. Z. S., p. 661.
1884. *Herpestes andersoni*, Murray. Vert. Zool. Sind., p. 34.

Under fur about normal, of a bright buff colour, dorsal hairs long as in *pallens* (50-55mm.), the dark rings less wide (7-8mm.) and more brightly coloured than in that race.

The dimensions quoted by both Blanford and Murray are unreliable, the former giving those of a flat skin, while the latter bases on a mounted specimen. Fortunately the British Museum has a female specimen presented by Capt. Whitehead, taken by him at Kohat, for which he recorded the following dimensions:—Head and body, 350; tail, 380; hindfoot, 73; ear, 25. *M. m. ferrugineus*, therefore, is the same size as the other races.

Both Blanford and Murray give the type locality as Kotree, Sind. As we have seen it has been taken at Kohat, and it therefore no doubt occurs in Baluchistan and perhaps the northern Punjaub.

Mungos lanka, sp. nov.

A species undoubtedly very closely related to *mungo*, but though all the above races of *mungo* appear to intergrade where they meet each other, *lanka*, as was to be expected from it's insular position, shows no such tendency with regard to *ellioti* it's nearest neighbour. It seems to me therefore most convenient to recognise it as a distinct species.

The general pattern of colouring is quite the same as in *mungo*, but there is a complete absence of ferruginous coloring on the face and feet.

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The under fur is very sparse, of a buff colour. The dorsal hairs are very short (30-35mm.), a yellowish-white colour, with four narrow (3-4mm.) rings, and a short tip, of a deep black brown, as in *ellioti*. As in *mungo*, the soles are bare to the heels.

Dimensions of the type:—Head and body, 380; tail, 316; hindfoot, 76; ear, 27·5. Skull:—Condylo-incisive length, 80; zygomatic breadth, 41·5. In general shape the skull is quite like that of *mungo*.

Habitat.—Ceylon, the Type from Cheddikulam.

Type.—Adult female, B. M. No. 15. 3. 1. 54. Original number 664. Collected by Major Mayor, on the 12th November 1913. Presented to the National Collection by the Bombay Natural History Society.

I.—On some specimens of Vandeleuria from Bengal, Bihar and Orissa.

BY

Oldfield Thomas.

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After the notes written last year in this Journal* about *Vandeleuria* it has been with much interest that I have examined a small series prepared by Mr. Crump in Bihar and Orissa during his Survey work.

At Lohra, Hazaribagh, on the plateau at an altitude of 1,000′, he obtained the single specimen which I provisionally referred to *V. oleracea*, a reference which I should now confirm, though the teeth are a little larger than those of the type and of other specimens from Ahmednagar. The condylo-incisive length of the skull is 20·9 mm., and the molars 3·4 mm. In colour this specimen is sandy fawn, rather less warmly buffy than is usual in *oleracea*, but the difference is of little importance. External dimensions:—Head and body, 76 mm.; tail, 123; hindfoot, 18; ear, 16.

But in Chaibassa, in a region where Mr. Wroughton tells me the country is much more heavily forested, Mr. Crump collected a series of Tree-mice which, while still belonging to the small-toothed *V. oleracea*, are of so different a colour that they evidently ought to be distinguished as a local race.

Vandeleuria oleracea marica, subsp. n.

Essential characters as in *V. oleracea*, but colour darker than in either of its described sub-species.

General colour above approaching russet-brown, decidedly darker than the wood-brown of *V. oleracea modesta*, and still more different

* Vol. XXIII, p. 200, Nov., 1914.

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from the buffy or sandy tones of *V. oleracea oleracea.* Sides clearer and more buffy. Undersurface wholly white. Hands dull whitish; feet pale brownish, considerably darker than in *oleracea.* Ears apparently averaging a little shorter than in true *oleracea.* Tail pale-brown, rather lighter below.

Dimensions of the type, measured in the flesh:—Head and body, 79 mm.; tail, 120; hindfoot, 18; ear, 15. Skull:—Imperfect. Estimated condylo-incisive length, 21 mm.; nasals, 7·7; inter-orbital breadth, 3·4; palatal foramina, 4·4; upper molar series, 3·2.

Habitat.—Chaibassa, Bihar and Orissa. Five specimens, including type, from Koira, 800′, one from Luia, 1,000.′

Type.—Adult female. B. M. No. 15·4·3·108. Original number 5422. Collected 10th August 1914 by C. A. Crump. Presented to the National Museum by the Bombay Natural History Society.

The possibility of a closer study of such interesting Indian genera of small mammals as *Vandeleuria* is entirely owing to the splendid work that is being done by the Bombay Society's Survey. Thanks to this great enterprise, series of specimens, without which no advance can be made, are being brought together both for study at the time and preservation with a view to further comparisons later.

All the more, however, will any specimens be appreciated that private members can obtain, to supplement those got by the Survey Collectors, especially now that the work of the latter has been interrupted by their unanimous enlistment in the service of their country.

Skins and spirit specimens from all parts of the Indian Empire will be gratefully received by those responsible for working out the mammals of the Survey.

J.—A new Monkey from the Chindwin River.

BY

R. C. Wroughton.

The Mammal Survey obtained on the west bank of the Lower Chindwin, at Kin, three specimens of *Presbytis phayrei,* a species which it also obtained from Mt. Popa and the Shan States. Higher up the river on the same bank, a single specimen of *P. pileatus* was obtained at Nansun Chaung. Of this specimen Mr. Shortridge notes: "Apparently the Langur occurring on the west bank of the River in the Upper Chindwin. Probably more confined to the hills than the other species." Finally on the east bank, between Homalin and Hkamti, was obtained a langur ranking in size and make with *pileatus,* and the peninsular langurs, rather than with the Burmese leaf-monkeys.

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While by its characters it falls into the same category as *P. pileatus* in Blanford's Key to the genus (Mammalia, p. 27), I can find no specimen at all resembling it in the National Collection, nor have I been able to trace any description that would fit it. Series of specimens were obtained at Homalin and Hkamti, which differ markedly in colouration. A single specimen taken at Minsin, half-way between these two places, shows a somewhat intermediate colouration.

I propose therefore to describe the Homalin form as a new species, under the name *shortridgei* and to rank the Hkamti form as a local race of it, under the name *shortridgei belliger*. The name refers to the khaki coat assumed by the northern animal.

Presbytis shortridgei, sp. n.

A Langur of the larger, stouter *schistaceus* type; most nearly resembling *P. pileatus*, but entirely lacking the yellow in the colouration of that animal.

Size large, larger and stouter than any of the Burmese Leaf-monkeys, such as *P. phayrei*.

Fur long and silky, about 50 mm. long on the back, 100-110 mm. on the flanks. Hair of crown laid straight back from the forehead, not radiating from one or more points, forming a "cap," as in *pileatus*.

General colour above and below pale bluish grey ("cinereous"), dorsal area much darker ("slate grey"), nape of neck paler, silvery grey. Face naked, moustache and eyebrows black. A white tuft on the points of the ears. (Mr. Shortridge notes that this white ear tuft is very conspicuous in life). Limbs coloured like flanks, hands and feet black. Tail like flanks for about 200-250 mm., remainder black.

Skull as in *P. pileatus*.

Dimensions of the type (recorded by the collector):—Head and body, 710; tail, 1,020; hindfoot, 196; ear, 35·5. Skull:—Greatest length, 115; basal length, 80; zygomatic breadth, 90; brain-case breadth, 63; breadth across orbits, 78; interorbital breadth, 14; cheek teeth, behind the canine, 31.

Habitat.—Homalin, Upper Chindwin, Burma.

Type.—Adult male B. M. No. 15·5·5·10. Original number 5,714. Collected by Messrs. G. C. Shortridge and S. A. Macmillan on the 17th July 1914, and presented to the National Collection by the Bombay Natural History Society.

Altogether 5 specimens were obtained (03¾02) at Homalin, and a male from Minsin, about half-way between Homalin and Hkamti. This last specimen is much less clear grey than those from Homalin and is no doubt an intermediate.

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Presbytis shortridgei belliger, subsp. n.

Quite like *shortridgei*, but the whole coat suffused with olive-brown.

Size and fur as in *shortridgei*.

Colour of all parts exactly as in *homalinus*, except that an olive-brown ("hair brown") is everywhere substituted for the clear grey of true *homalinus*.

Dimensions of type (recorded by collector):—Head and body, 655; tail, 930; hindfoot, 206; ear, 36. Skull:—Greatest length, 117; basal length, 81; zygomatic breadth, 92; braincase breadth, 61; breadth across orbits, 75; interorbital breadth, 12; cheek teeth behind the canine, 30.

Habitat.—Hkamti, Upper Chindwin, Burma.

Type.—Adult male. B. M. No. 15·5·5·14. Original number 5927. Collected by Messrs. G. C. Shortridge and S. A. Macmillan on the 3rd August 1914. Presented to the National Collection by the Bombay Natural History Society.

In all 5 specimens, all males, were obtained.

K.—Notes on Taphozous and Saccolaimus.

BY

Oldfield Thomas.

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In connection with the fine material from various parts of India received from the Bombay Survey, I have looked through the Museum material hitherto referred to the difficult genus *Taphozous*, and find some few points worthy of being considered as "results" of the mammal survey.

In the first place with regard to the genus. Dobson in his Catalogue divided it into two sub-genera, *Taphozous* and *Taphonycteris*, on account of the absence in the latter of the radio-metacarpal pouch in the wing. Quite recently Mr. Hollister* has proposed that *Taphonycteris* should be recognised as a distinct genus, on the ground of its cranial characters, and in this I think he is right. But in using the name *Taphonycteris* he has overlooked the fact that *Saccolaimus*, Lesson, quoted both by Palmer and Miller, is applicable to the group, and antedates *Taphonycteris* by many years.

From *Taphozous*, *Saccolaimus* is distinguishable by not having the radio-metacarpal pouch, and in the skull by various characters, of which the most important are the completeness of its bullæ, these being imperfect antero-internally in *Taphozous*, and its much broader

* Proc. U. S. Nat. Mus. 46, p. 308. 1913.

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mesopterygoid fossæ, of which the posterior end is of quite a different shape. The small anterior premolar is also proportionally larger.

The only Indian species is *Saccolaimus saccolaimus*, of which Blyth's *Tapho ous crassus* appears to be a synonym.

Taphozous nudiventris and *kachhensis*.

These two bats are undoubtedly very closely allied, and are not, as Dobson thought, distinguished by any difference in the gular sac. In both the male has a shallow sac, its posterior wall 1-2 mm. in depth, while the female has none, but has a naked area corresponding to the position of the sac.

A comparison of skulls, however, shows that the Asiatic form is larger and heavier, and they may therefore be kept as distinct species. The skull of *kachhensis* generally exceeds 27 mm. in length from the occipital crest to the base of the canines, while in *nudiventris* this dimension is under 26 mm. And the larger skull is even disproportionally more bulky throughout.

The ranges of the two correspond geographically with the Continents, *kachhensis* Asiatic, from Palestine, through Mesopotamia and Persia, to India and Burma; *nudiventris* African and Arabian.

Considering its great range, from Palestine to Burma, it is not surprising that *T. kachhensis* is distinguishable into several geographical races, of which three ought to be recognised by name, respectively, western, central and eastern. The central, typical form is now, thanks to the Bombay Natural History Society's Survey, represented in the Museum by a fine series of specimens, ranging from Cutch to Bellary in S. India and Hazaribagh in Bengal. All are very similar in colour and other characters, while the western and eastern forms may be distinguished as follows:—

Taphozous kachhensis babylonicus, subsp. n.

Colour much paler than in true *kachhensis*.

Size at a maximum, the type slightly larger than any Indian specimen available. Fur short, almost as much so as in the Burmese race. General colour above drabby whitish, the hairs white at base, pale brownish drab at tip; in true *kachhensis* the colour is pale olive brown or sepia. Undersurface dull white or pale brownish white, the middle line whiter, the sides browner.

Skull stout and heavy, averaging slightly larger than in true *kachhensis*.

Dimensions of the type:—Forearm, 81 mm.; another specimen, 82.

Skull:—Greatest length (c) 28·8; length from condyle to front of canine, 26.8; zygomatic breadth, 18.3; interorbital breadth, 8.7;

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intertemporal breadth, 5; palato-sinual length, 8.4; maxillary tooth-row, 12.2.

Habitat.—Palestine and Mesopotamia. Type and two paratypes from the Euphrates, other specimens from Fao, Persian Gulf (W. D. Cumming) and the Lake of Galilee (H. B. Tristram).

Type.—Adult male. B. M. No. 50.10.21.3. Collected during the Euphrates expedition.

The colour of the Palestine examples is doubtful, as they are spirit specimens in somewhat bad condition, but geographically they should belong to the Babylonian race.

A *Taphozous* from Muscat, which might have been expected to be this form, proves to be assignable to the Egyptian *T. nudiventris*.

Taphozous kachhensis nudaster.

Colour practically as in *kachhensis*, but fur shorter and poorer.

Size slightly less than in true *kachhensis*. Fur both above and below excessively short and thin, the hairs of the posterior half of the back hardly more than two mm. in length, and so sparse and poor that the light bases of the hairs are visible, even in smoothly brushed specimens. In *kachhensis* the fur is normal and close, and the light bases of the hairs hidden. The bases themselves are white for their basal and brown for their terminal halves, but the brown is of a rather more purplish tinge than in *kachhensis*.

Skull as in *kachhensis* but on the average a little smaller. The type has an unusually broad intertemporal space, but other specimens are as in *kachhensis*.

Dimensions of the type:—Forearm, 78 mm. Head and body, 102; tail, 35; ear, 22.5; third finger, 129.

Skull:—Greatest length, 27.8; length from condyle to front of canine, 24.6; zygomatic breadth, 17.2; interorbital breadth, 8.4; intertemporal breadth, 5·7; palato-sinual length, 7·4; maxillary tooth-row, 11.

Habitat.—Dry zone of Burma. Typical series from Pagan, near Mt. Popa.

Type.—Adult male. B. M. No. 14.7.19.46. Original number 4176. Collected 27th October 1913 by G. C. Shortridge. Presented by the Bombay Natural History Society. Ten specimens.

The difference in the pelage is so marked in all the considerable number of specimens examined that it seems to justify the recognition of the Burmese race as a distinct sub-species.

Taphozous theobaldi, Dobs.

The range of this species, which has been recorded from Tenasserim, Malay Peninsula and Java, has been recently greatly extended

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by the capture of some specimens in Nimar, Central Provinces of India, by Mr. Crump, working for the Bombay Survey.

The Nimar specimens however, as might be expected, show certain differences from the Malay form, and may be distinguished as a distinct sub-species.

Taphozous theobaldi secatus, subsp. n.

Size as in true *theobaldi*. Fur close and fine, not extending on to the wing-membrane or interfemoral above, and only on the wings close to the side of the body below, the ending of the furry part extremely sharp and well-defined. In *theobaldi* on the other hand the fur extends on to both wing and interfemoral membranes above and below for a certain distance from the body, its limits quite vague and undefined. Colour above sepia, the hairs over most of the body brownish whitish basally, but laterally and on the rump the hairs are sepia to their bases. In *theobaldi* the general colour is a brighter brown, tipped on the hinder back with greyish, and the bases of the hairs are everywhere strongly contrasted drabby whitish. Under surface slightly paler than upper, the region across the throat darker, but without the definite blackening usually present in *theobaldi*.

Skull as in *theobaldi*.

Dimensions of the type:—Forearm, 71 mm. Head and body, 89 mm.; tail, 28; ear, 24.

Skull:—Greatest length, 23·5; condyle to front of canine, 22·5; zygomatic breadth, 13·7; interorbital breadth, 7·1; palato-sinual length, 6; maxillary tooth-row, 10·1.

Habitat.—Nimar, Central Provinces. Type from Asirghar, 2000′.

Type.—Adult male. B. M. No. 12.6.28.5. Original number 644. Collected 31st October 1911 by C. A. Crump. Presented by the Bombay Natural History Society. Two specimens.

Taphozous longimanus.

The three members of the *T. longimanus* group that have been described from the E. Indian Archipelago are all smaller than the true continental *T. longimanus* and might conveniently be recognised as forming one species with three sub-species, whose names would be *T. leucopleurus leucopleurus*, Dobs. (Flores), *T. leucopleurus albipinnis*, Thos. (Borneo and Malay Peninsular) and *T. leucopleurus kampeni*, Jent. (Java). Their skulls appear to be quite similar to each other and their only differences lie in the colour of the fur and wings as described by their respective authors.

Taphozous achates, sp. n.

Essential characters as in *T. melanopogon*, but skull conspicuously larger.

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No pouch, at least in female, the usual situation of the pouch completely hairy, as in *melanopogon*. Ears fairly large, the anterior margin straight, slightly papillate. Colour apparently as in *melanopogon*. The hairs, which are about 5·6 mm. in length on the back, white for their basal halves, dark brown terminally, the two colours strongly contrasted. Wing membranes brown above and below, a narrow line along the hinder edge white.

Skull as in *T. melanopogon*, and similarly distinguishable from that of *T. longimanus* by its longer basial pits, but conspicuously larger in all dimensions.

Dimensions of the type :—Forearm, 62 mm. Head and body, 73; tail, 24; ear, 20; third finger, metacarpal 55, first phalanx, 20; lower leg and hind foot (c. u.), 36.

Skull :—Greatest length, 21·5; condyle to front of canine, 2·12; interorbital breadth, 6·4; intertemporal breadth, 5; mastoid breadth, 11·5; palato-sinual length, 6·7; maxillary tooth-row, 9·8.

Habitat.—Savu Id., East of Timor.

Type.—Adult female in spirit, B. M. No. 97·4·18·23. Collected August 1896 by Alfred Everett. Two specimens.

Although I have not been able to examine any Javan topotypical specimens of *T. melanopogon*, it is evident that Temminck's animal was really the smaller of the two allied forms, as his figure of the skull exactly agrees with Indian examples of "*melanopogon*," and the forearm length given by him is only 59 mm.

From the Australian *T. australis*, which is of about the same size, this bat may be distinguished by the complete absence of a gular pouch, whose usual position is thickly hairy.

Taphozous melanopogon.

The specimens recorded as of this species in the reports on the Bombay Survey from the Ajanta Caves, close to the border of E. Khandesh—Report No. 1 (Journ. Bomb. N. H. Soc., xxi., p. 399, 1912), are correctly so named, as are all those from localities east and south of this. But those from Cutch—Report No. 3 (op. cit. xxi, p. 830, 1912)—and Kathiawar, Report No. 10 (op. cit. xxii, p. 494, 1913) are quite a different species, and one new to the Indian Fauna. This is the N. African *T. perforatus*, Geoff., which, like a number of other African species, just penetrates to this north-western corner of India.

It may be distinguished from *T. melanopogon* by its smaller size, paler colour, and the absence of the conspicuous black beard which is almost always present in the male of the allied species.

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Taphozous australis georgianus, sub-sp. n.

Like typical *T. australis* in size, rudimentary condition of gular sac in female, and colour (so far as can be made out on spirit specimens) but distinguished by the fact that the intertemporal constriction of the skull is markedly narrower, and the basial pits are longer. In six specimens of *T. australis*, from the Cape York region, including the two co-types, the intertemporal constriction is uniformly just 5 mm. across, while in two specimens of *georgianus* it is 4·1 mm. which makes a material difference in the general aspect of the skull. Basial pits in *T. australis* 3·5 mm. in length, and ending about a millimeter from the large vacuities outside the nasal cavities, in *T. a. georgianus* 4·1 mm. in length, and ending quite close to the vacuities.

Other characters apparently as in *T. australis*, except that the rudimentary indication of a gular sac is less perceptible than in that form.

Dimensions of the type:—Forearm, 65 mm. Head and body, 78; tail, 25; ear, 21; third finger, metacarpal, 60, first phalanx, 21·5; lower leg and hind foot (c. u.), 36·5.

Skull:—Greatest length, 22·2; condyle to front of canine, 21; zygomatic breadth, 13·7; interorbital breadth, 6·2; intertemporal breadth, 4·1; mastoid breadth, 11; maxillary tooth-row, 9·6.

Habitat.—Western and North-Western Australia. Type from King George's Sound; a second specimen (imperfect) from the Mary River, Northern Territory.

Type.—Adult female in spirit. B. M. No. 44. 2. 27. 59. Presented by Sir John Richardson.

This sub-species is founded primarily on specimen *d* of Dobson's Catalogue, a female, which, when it first came, was accompanied by a male, but the latter has now unfortunately disappeared. This specimen *d* was said by Dobson to be the type of Gould's species *australis*, but a reference to the original description, in the "Mammals of Australia*, shows that *australis* was founded on two specimens from Albany Id., Cape York, which are Dobson's *b* and *c*, these therefore being the co-types of the species. Four other specimens from the Cape York region all quite agree with the co-types of the species in the characters now used to separate the Western form.

Taphozous perforatus hœdinus, su-bsp. n.

Essential characters as in true *perforatus*, but colour much darker throughout. Upper surface sepia brown, the basal half of the hairs white. Throat sepia, the interramial region suffused with wood-

*Vol. III, pl. 32, 1854.

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brown; belly greyer, the basal halves of the hairs white, the terminal halves grey, with or without whitish tips. Ears and membranes uniformly dark brown throughout.

Skull much as in *perforatus*, perhaps a little larger on the average, and the braincase slightly more inflated.

Dimensions of the type:—Forearm, 63 mm.

Skull:—Greatest length, 20; condyle to front of canine, 19·4; breadth of braincase, 9·8; maxillary tooth-row, 8·8.

Habitat.—N. E. British E. Africa and Aden. Type from the Chanler Falls, Eusso Nyiro, British East Africa. Other specimens from Hodeida (Bury) and Aden (Yerbury, Percival and Dodson).

Type.—Adult male. B. M. No. 12. 7. 1. 46. Original number 756. Collected 3rd September 1911, and presented by A. Blayney Percival, Esq.

True *T. perforatus* of Egypt, and also of Cutch and Kathiawar, is of a comparatively pale brown colour, and the wing membranes are markedly paler than is the case in the Chanler Falls and Aden specimens.

Taphozous hildegardeæ, Thos.

This East African species, which has so striking a resemblance to *T. melanopogon* in its general characters and its development of a black beard in the male, may be distinguished by its pale colour, white wings, and by the fact that the skull of the male is distinctly larger than that of the female. This is also the case in *T. sudani*.

On the other hand in such of the remaining species as I have had the opportunity of examining, including *T. perforatus*, *mauritianus*, *melanopogon*, *longimanus* and *theobaldi*, and in the available species of *Saccolaimus*, there appears to be little if any sexual difference in the size of the skull. In *T. kachhensis* however there is a little difference, but less or none in its sub-species *nudaster* and in *T. nudiventris*.

L.—The Burmese Civets.

BY

R. C. Wroughton.

The Mammal Survey collection from the Chindwin River contained three specimens of Civet. One of these, unfortunately lacking the skull, is exactly like one in the National collection, which also has no skull, from Shensi in China. The present specimen is from Nagpur, near Kindat, on the border of Manipur. Though these two specimens differ considerably from the common *Viverra zibetha*, yet with such poor material and such confused distribution, I do not dare to give it a name, but record it with

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the hope of calling the attention of local members to this interesting desideratum. The two other specimens represent a well marked local race of *Viverra zibetha*, which I propose to call *picta*.

Viverra zibetha picta, sub-sp. n.

A local race of *V. zibetha*, distinguished by its bright marking. Size and fur as in true *zibetha*.

General colour scheme as in *zibetha*, including the yellowish tinge in the ground colour, but all the dorsal markings most distinct. On the posterior half of the back the markings on each side of the median black crest coalescing to form continuous black lines parallel with it, only separated from it by narrow continuous lines of the ground colour (a buffy grey).

Skull as in *zibetha*.

Dimensions of the type:—Head and body, 800; tail, 435; hind-foot, 126; ear, 53. Skull:—Greatest length, 136 (140); basilar length, 124 (130); greatest breadth, 70 (74); braincase breadth, 39 (40); greatest length of carnassial, 13·5 (15·5); length of bullæ, 18 (18·5).

Habitat.—Hkamti, Upper Chindwin River.

Type.—Adult male, B. M. No. 15.7.1.9. Original number 5900. Collected by Messrs. G. C. Shortridge and S. A. Macmillan, on the 31st July 1914, and presented to the National Collection by the Bombay Natural History Society.

The second specimen was taken at the same place and on almost the same date. Though labelled as a male, it is apparently a female. it agrees in all characters both of skin and skull with the Type, except in so far as can be accounted for by sex.

On laying out all the material in the National Collection in order to compare the above specimens, I found that the Lower Burma specimens of *zibetha* are easily distinguishable by the clear grey of the ground colour, and I propose to separate them under the name *pruinosa*.

Viverra zibetha pruinosa, sub-sp. nov.

A local race of *zibetha*, distinguished by the total absence of the yellow tinge in the ground colour of that species.

Size and fur as in true *zibetha*.

General colour scheme exactly as in *zibetha*, but the tips of all the hairs pure white, not buffy as in *zibetha*.

Skull as in *zibetha*, but bullæ markedly longer.

Dimensions of the type:—Head and body, 760; tail, 432; hind foot, 132; ear, 51. Skull:—Greatest length, 140; basilar length, 129; greatest breadth, 71; braincase breadth, 37; greatest length of carnassial, 16; length of bullæ, 22.

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Habitat.—Tenasserim, extending northwards to the Shan States, and southwards to the Malay Peninsula. (Type from Thaget, Little Tenasserim River.)

Type.—Adult male. B. M. No. 14. 12. 8. 106. Original number 5003. Collected by Mr. G. C. Shortridge on 28th March 1914, and presented to the National Collection by the Bombay Natural History Society.

The Mammal Survey obtained 6 specimens in the Shan States and 6 in Tenasserim. There is one from the Malay Peninsula in the National Collection. A specimen obtained by G. W. Dawson, I.C.S., at Yin which is recorded in the Supplement to the Tenasserim Report, appears to be intermediate between *zibetha zibetha* and *zibetha pruinosa*.

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THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED.

BY

E. BLATTER, S.J.

PART XIV.

(*With Plate* lxxx.)

(*Continued from page* 744 *of Volume XXIII.*)

PINANGA, Bl. in Rumph. II, 76, t. 87, 108A, 109-116.

(From the vernacular name "Pinang.")

Mart. Hist. Palm. III, 183.—Griff. Palms Brit. Ind. 146, t. 230 C, 231, 232, A, B, C, 235.—Miq. Fl. Ind. Bat. III, 20 (1, 3, 5-20).—Scheff. Natuurk. Tijdsch. Ned. Ind. 32, 171.—Kurz For. Fl. II, 538.—Wendl. und Drude. Linnæa, 39, 176.—Drude, Bot. Zeitg. 1877, t. 5, fig. 12, 13.—Benth. and Hook. Gen. Pl. III, II, 884, 3.—Hook. Fl. Brit. Ind. VI. 406.

Unarmed; stem erect, annulate. Leaves pinnate, with the upper leaflets confluent.

Flowers monœcious, androgynous, ternate, 1 female between 2 males, the clusters in 2 or 4 or 6 series on spadices from the stem below the leaves; spathe solitary. Male flowers obliquely 3-quetrous; sepals 3, acute, keeled, not imbricate; petals 3, ovate or lanceolate, valvate; stamens 6 or more; anthers subsessile, basifixed, erect. Female flowers much smaller than the males, ovoid or globose; sepals 3, orbicular, imbricate; petals 3, orbicular, broadly imbricate; ovary 1-celled; stigmas 3; ovule basilar, erect.

Fruit ovoid or ellipsoid, pericarp fibrous; seed ovoid or ellipsoid; albumen ruminate; embryo basilar. Species about 45.

DISTRIBUTION.—Indo-Malayan 1. New species have been described by Beccari in Webbia I (1905), p. 316-27 and III (1910), p. 193.

CULTIVATION IN EUROPE.—The species of this genus are stove palms. They thrive best in a compost of one part loam, two of peat, and a little sand. A liberal supply of water is necessary. Propagated by seeds.

* INDIGENOUS SPECIES.

PINANGA HEXASTICHA, Scheff. in Ann. Jard. Bot. Buitenz. I, 148; Kurz For. Fl. II, 539; Becc. in Ann. Jard Bot. Buitenz. II, 80, 86; Males. III, 122; Hook Fl. Brit. Ind. VI, 406; Brandis Ind. Trees, 647.—*Areca hexasticha*, Kurz. in Journ. As. Soc. Beng. XLIII, II, 201, t. 12.

DESCRIPTION.—An evergreen, slender, simple-stemmed, gregarious palm; stem 20-30 feet high, $1\frac{1}{3}$ inch in diameter. Leaves 3-5 feet long, pinnate, with the end-pinnæ confluent; leaflets linear, somewhat falcate, 1-$1\frac{1}{2}$ feet long, many, alternate, 2-3 ribbed, many nerved, the lower acuminate, the upper and terminal

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crenate, lobed and ending into as many bluntish and shortly 2-lobed lobes as there are ribs; petiole short, 3-4 inches long, scaly, sheathing at the base; sheaths thinly scaly-rough, soon turning glabrous.

Spadix stout, simple, reflexed; rhachis as thick as the finger, fleshy. Male flowers in 5-6 series; female perianth (in young fruit) very much like that of *P. gracilis*, the sepals and petals almost; coniform, broad-oval, blunt or bluntish, about a line long or a little longer; staminodes apparently none; unripe fruits fibrous-fleshy, smooth, fusiform and narrowed at the apex.

HABITAT.—In marshy places of the tropical forests of the southern parts of the Pegu Yoma, as, *e.g.* between Kyanzoo and Kya Eng (Pazwoondoung Valley).

PINANGA GRACILIS, Bl., Rumph. II, 77; Kurz For. Fl. II, 538; Becc. in Ann. Jard. Bot. Buitenz. II, 81, 86; Hook Fl. Brit. Ind. VI, 407; Brandis Ind. Trees 647.—*P. patula β. gracilis*, Scheff. in Natuurk. Tijdsch. Ned. Ind. XXXII, 178.—*Seaforthia gracilis*, Mart. Hist. Nat. Palm. III, 185, 313; Kunth Enum. III, 191.—*Areca gracilis*, Roxb. Fl. Ind. III, 619; Griff. in Calc. Journ. Nat. Hist. V, 460; Palms Brit. Ind. 154, t. 232, A, C, f. 2; Kurz in Journ. As. Soc. Beng. XLIII, II, 201; T. Anders. Journ. Linn. Soc. XI, 5.—*Nenga gracilis*, Becc. Males. I, 25.

NAMES.—Ram gua (Beng.); Tawkun (Burm.).

DESCRIPTION.—The stems are slender, usually gregarious, 6—20 feet high, 6-8 lines in diameter, distinctly and distantly annulate, crown of about five or six leaves, which are 3-4 feet long; sheath half a foot long, the naked part of the leaf-stalk being 3 or 4 inches long; petiole and sheath scurfy. Leaves sparingly pinnate; leaflets inserted by a very broad base, about a foot long, lower ones 2-3-ribbed, finely acuminate, upper ones 3-5 inches broad, præmorse, many-ribbed, obcuneate, truncate, bipartite to the middle, about 8-cleft, divisions bidentate, emarginate, or entire and acute. Spathe solitary, bifid. Spadix simple, reflexed. Male flowers in three rows, broad, flat, imbricating; calyx minute, three-cornered; petals 3, obliquely cordate, cuspidately acuminate, many times longer than the calyx. Stamens numerous, shorter than the corolla. Female flowers in large shallow niches with 3-toothed margins, much smaller than the male flowers. Sepals broad, round. Petals like the sepals, but smaller. No rudimentary stamens. Ovary ovate, 1-celled; ovule one, erect. Style very short, stout.

Fruit half an inch long and three or four lines broad, ovate, tapering to the tip, scarlet or orange, smooth. Albumen highly ruminate. Embryo basilar.

HABITAT.—Sikkim, sub-Himalayan tract and valleys up to 2,000 feet, common; Assam; Khasia Hills; Cachar; Chittagong; Arakan Yoma; Pegu; Martaban; Tenasserim, in damp evergreen forests, ascending to 3,500 feet.

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Flowers during the hot and rainy season; fruit ripens the following year.

PINANGA GRIFFITHII, Becc. Males. III, 117; Hook. Fl. Brit. Ind. VI, 407; Brandis Ind. Trees, 647.—*Areca sp.*, Griff. in Calc. Journ. Nat. Hist. V, 461 (under *A. gracilis*, fruit only); Palms Brit. Ind., 155 to 232 (spadix only).

DESCRIPTION.—Stem slender; leaves pinnatisect; leaflets numerous, 3 to many-costate.

Spadix reflexed, subdigitately branched; peduncle of spadix 2 inches long; branches 3-5, spreading, not compressed. Calyx of male flowers shorter than the petals.

Fruits arranged spirally in 4 lines, ovoid, rather more than half an inch long and $\frac{1}{4}$ inch broad, narrowed at the base, mammillate; pericarp thin; albumen deeply ruminate.

This palm is imperfectly known. I have only copied the meagre descriptions given by Griffith and Beccari.

HABITAT.—Khasia Hills.

PINANGA MANII, Becc. Males. III, 178; Hook. Fl. Brit. Ind. VI, 409; Brandis Ind. Trees, 647.—*Areca costata*, Kurz. in Journ. As. Soc. Beng. XLIII, II, 200 (excl. omnib. synon.)

DESCRIPTION.—Trunk 50 feet high, $5\frac{1}{2}$ inches in diameter. Leaves 15-20 feet long ($6\frac{1}{2}$ feet according to Hooker, l.c.); leaflets very many, strongly 1-3 nerved, 3 feet long, 3 inches broad, ensiform, straight, pale beneath; leaf-sheaths 4 feet long, clasping the stem.

Spadix 19-20 inches long, shortly peduncled, branches 40-50, spirally arranged, filiform, pendulous. Flowers biseriate. Male sepals about as long as the petals.

Fruit small, $\frac{4}{10}$ by $\frac{2}{10}$—$\frac{3}{10}$ inch, ovoid from an acute base; seed subglobose; raphe reticulate; albumen densely ruminate.

HABITAT.—Nicobar Islands; South Andaman Islands.

PINANGA KUHLII, Bl. in Bull. Néerl. (1838) 65; Rumph, II, 82, t. III and β t. III, f. 11-13; Kunth. Enum. III, 641; Miq. pl. Jungh. 57; Scheff. in Natuurk. Tijdsch. Ned. Ind. XXXII, 182; in Ann. Jard. Bot. Buitenz I, 152; Becc. Males. III, 138; Hook. Fl. Brit. Ind. VI. 409; Brandis Ind. Trees 647—*P. costata*, Bl. in Bull. Néerl, l.c.; Rumph. l.c. 80, t. 109 and β t. 109 C.; Kunth. l.c.; Miq. l.c. 156; Kunz. For. Fl. II, 538, F.—*Seaforthia Kuhlii*, Mart. Hist. Nat Palm, III. 185, 313—*S. oryzæformis*, Mart. l.c. 185, ed. I. (excl. omnib. syn. except. Gaert.)—*P. nova*, Bl. in Rumphia II, 81, t. 110, A—E.—*P. coronata*, Bl. in Rumphia II, 83, t. 112, 113.—*S. costata*, Mart. l c. 313.—*Ptychosperma kuhlii*, Miq. Fl. Ind. Bat. III, 21, De Palm. Archip. Ind. 23.—*P. costata*, Miq. ll. cc. 25, 23.—*Areca oryzæformis*, Gaertn. Fruct. I, 20, t. 7, f. 2, 6 (non Rumph.)

DESCRIPTION.—Stem soboliferous, 20—30 feet high (10 feet according to Becc.). Leaves 3—4 feet long, pinnate, with rather narrow confluent end-pinnæ; leaflets 1—2 feet long, linear to

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Pinanga Kuhlii, Bl., in the Botanic Garden of Peradeniya.

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linear-lanceolate, somewhat falcate, prominently and strongly 2-3 ribbed above, the lower ones long-acuminate, the upper and terminal ones terminating in as many bluntish 2-lobed lobes; petiole variable in length, subscurfy.

Spadix 1 foot long, refracted, shortly peduncled, robust, simply branched, glabrous; branches elongate. Flowers sessile, distichous, either all females in the same spadix, or each female accompanied by 2 males. Female flowers: sepals and petals almost conform, nearly 1½ line long, broadly ovate or orbicular, blunt or obsoletely mucronulate.

Fruit nearly ½ inch long, seated on the cup-shaped perianth obovoid to ellipsoid, smooth, thin fleshy-fibrous; seed adherent to the pericarp, albumen deeply ruminate.

HABITAT.—South Andaman Islands—Sumatra; Java.

Fruit ripens in June.

ILLUSTRATION.—We have to thank Mr. Macmillan for the photograph reproduced on plate LXXX. It represents a tuft of *Pinanga kuhlii*, the stems being covered with lichens.

PINANGA DICKSONII, Bl. Rumph. II, 85; Scheff. in Natuurk. Tijdsch. Ned. Ind. 174; in Ann. Jard. Bot. Buitenz. I., 149; Becc. Males III, 138; Hook. Fl. Brit. Ind. VI, 409; Brandis Ind. Trees 647; Talb. Trees Bomb. ed. 2, p. 339; Cooke Fl. Bomb. Presid. II, 803.—*Areca dicksonii*, Roxb. Fl. Ind. III, 616; Griff. in Journ. As. Soc. Beng. V, 458; Palms Brit. Ind. 153 t. 231.—*Seaforthia dicksonii*. Mart. Hist. Nat. Palm III, 184, 313; Kunth Enum. III, 190.

DESCRIPTION.—A slender, smooth, green-stemmed palm, stem solitary, tall, 16-20 feet high, of about 2 inches in diameter, soboliferous. Leaves pinnate, forked, about 4 feet long; leaflets numerous, sessile, elongate, 12-24 inches long and ¾-1 inch broad, with numerous parallel veins, apices præmorse, dentate.

Spadix retrofracted, compound; ramifications from 4-8, alternate, simple, equal, distichous, from 6-8 inches long, stout, clothed with imbricating flowers. Spathe simple, rigid, compressed. Male flowers: Calyx 3-cleft, divisions subulate, nearly as long as the corolla; petals 3, ovate, cordate, valvate, tapering at the tips. Stamens from 20-30; filaments very short; anthers linear; pistillode 0. Female flowers: spathes 3, reniform, corolla like the calyx; staminodes 6, clavate, penicillate, style short; stigma 3-lobed.

Berry oblong, dry, fibrous, ½-¾ in. long by ⅓ in. in diameter. Seed of the shape of the berry, ruminated. Embryo basilar.

HABITAT.—Found in great abundance on the mountains of Travancore and Malabar; in the evergreen forests near the Gairsoppa and Nilkund Ghats of Northern Kanara, gregarious and locally abundant. Flowers and fruit ripens in August.

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USES.—The poorer classes eat the nut as a substitute for the common betel-nut, but no other part of the tree appears to be employed for any useful purpose.

PINANGA HOOKERIANA, Becc. Males. III, 175; Hook. f. Fl. Brit. Ind. VI, 410.

DESCRIPTION.—Stem slender, 3-4 feet high; internodes clavate, young scurfy; petiole and rhachis of leaves scurfy. Leaves 4½ feet long; leaflets numerous, opposite, one foot long, narrowly linear-lanceolate, subfalcate, acuminate, 2-3-ribbed, 3-4-keeled above, terminal lobe bifid; petiole 6 inches long.

Spathe 4 inches long; spadix 3-4 inches long with a slender peduncle and 4-5 slender branches which are compressed, flexuose and crowded with flowers. Male flowers: calyx 3-toothed, membranous; petals unequal, much longer than the sepals; stamens about 15; pistillode 0. Female flowers: sepals and petals subequal; stigma large, discoid; staminodes 0. Fruit about ½ inch long by ¼ inch. diameter, ellipsoid, narrowed at the top. (Hooker.)

HABITAT.—Khasia Hills, 2-4000 feet; Nunklow and Churra.

PINANGA HYMENOSPATHA, Hook. f. Flora Brit. Ind. VI, 411.

DESCRIPTION.—Stem slender, as thick as a goose-quill; internodes long. Petiole and rhachis of leaves, slender, scurfy. Leaves 12-14 by 4-5 inches, leaflets very numerous, 15-20 pairs, regularly close set, 3-4 by ¼-⅓ inch, alternate, flat, thin, narrowly ensiform, finely acuminate, unicostate, dark-green above and brownish beneath when dry; rib slender, prominent on both surfaces; petiole 3 inches long, subterete; sheath 3-4 inches long, striate.

Spathe 1½ inch long, ellipsoidly fusiform, erect, quite membranous, subhyaline. Spadix very short, about as long as the spathe, flowering to the base. Male flowers: flat, imbricate, ¼ inch in diameter, trapezoidly orbicular; dorsal sepals twice as long as the others, apiculate; stamens 9, unequal; filaments very short, anthers linear. Female flowers minute, globose; ovary ovoid; stigma pulvinate; ovule erect. (Hooker.)

HABITAT.—Burma; at Moulmein.

Hooker calls this palm "a very distinct species remarkable for its membranous spathe and very elegant form."

* * INTRODUCED SPECIES.

PINANGA PARADOXA, Scheff. in Natuurk. Tijdsch. Ned. Ind. XXXII, 31; Becc. Males. III, 129, in nota; Hook. f. Fl. Brit. Ind. VI, 411; Ridley. Fl. Malay. Penins., II, 141.—*Areca curvata*, Griff. Notul., III, 164 (*partim*).—*Areca paradoxa*, Griff. in Calc. Journ. Nat. Hist. V, 463; Palms Brit. Ind., 156, quoad descriptionem fructus et figuram ejusdem in t. CCXXXVII, C. f. 11.—*Kentia paradoxa*, Mart. Hist. Nat. Palm., III, 312.—

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Nengella paradoxa, Becc., Males. I, 32.—*Ophiria paradoxa*, Becc. in Ann. Jard. Bot. Buitenz. II, 128.—*Cladosperma, n. g.*, Griff. Notul. III, 165.

DESCRIPTION.—Stems very slender, 3-12 feet high, $\frac{1}{4}$ inch in diameter, internodes 2 inches long. Leaves about 1 foot long, entire and oblong, or with 3-6 pairs of sigmoidly linear-lanceolate acuminate leaflets, leaflets mostly alternate, broad, 5 inches long, 1 wide, lower ones acuminate, terminal one broadly cuneate, deeply cleft, often unequally, margin truncate, toothed; petiole 6 inches long or less, scurfy.

Spadices usually 2 or 3 on a stem, unbranched or with 2 branches 3-4 inches long, undulate. Flowers distichous. Male flowers $\frac{1}{4}$ inch long. Sepals short acute. Petals lanceolate with long points. Stamens 6, filaments very short. Female flowers: calyx short, lobes rounded, petals hardly longer.

Drupe red, slender, curved, fusiform, $\frac{1}{2}$ inch long. Seed fusiform, albumen ruminate with 6 long longitudinal lines of rumination (according to Ridley, albumen equable according to Hook. Fl. Brit. Ind.).

HABITAT.—Jahor: Gunong Panti; Malacca: Mount Ophir; Selangor: Bukit Kutu, Bukit Hitam; Perak: Larut Hills; Negri Sembilam: Gunong Angs; Kedah: Gunong Jerai (ex Ridley). Grown in Indian gardens.

PINANGA PATULA, Bl. Rumphia, II, 86, 87, t. 115; in Bull. Néerl. 1838, 65; Kunth. Enum. III, 641; Kurz in Journ. As. Soc. Beng. XLII, II, 201; Becc. Males. III, 139; Hook. f. Fl. Brit. Ind. VI, 411; Ridley, Fl. Malay. Penins. II, 143.—*Seaforthia patula*, Mart. Hist. Nat. Palm. 323—*Ptychosperma patula*, Miq. Fl. Ind. Bat. III, 26, and Suppl. 253; in Journ. Bot. Néerl. I, 7.

DESCRIPTION.—Stems tufted, slender, 6-20 feet high, $\frac{1}{2}$-$1\frac{1}{2}$ inch in diameter, internodes $2\frac{3}{4}$-$3\frac{1}{4}$ inches long. Leaves 2-3 feet long, pinnate; leaflets few, rarely many (6 pairs according to Ridley), broad, distant, sigmoidly lanceolate and falcate from a narrowed base, caudate-acuminate, 2-many-nerved, terminal broader, 7-9-nerved, truncate and deeply bifid.

Spadix deflexed, 2-5-branched; branches rather slender, 6 inches long, red. Spathe and male flowers not known. Female flowers: sepals orbicular, obtusely erose-crenulate. Petals smaller and rounder.

Drupes flesh colour, elliptic, ribbed, narrowed and acute at the tip, when dry over $\frac{1}{4}$ inch long. Seed elliptic, ruminate.

HABITAT.—Pahang: Sahan River at Kwala, Tenok; Perak: Ulu Bubong (ex Ridley); Sumatra, Borneo.

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NOTES FROM SOUTHERN TIBET.

BY

CAPT. F. M. BAILEY, C.I.E.

(*With a plate.*)

The following Notes were made on a journey made in company with Captain Morshead, R.E., in 1913. An account appeared in the *Geographical Journal* for October 1914, and the places named in these notes will be found in the map published with that paper. I was unfortunate in having no one able to skin, which resulted in fewer specimens being brought back than would otherwise have been the case. Another misfortune which occurred was the theft of all our shot-gun cartridges, and for two months we travelled through country where no collector had ever been, without being able to secure a single specimen. Major Evans has described the butterflies collected in Volume XXIII, pages 532-546, of the Journal. A sketch map accompanies Major Evans' paper and a brief itinerary :—

MAMMALS.

In the following list of Mammals those marked * were obtained and have been presented to the British Museum. The small Mammals were identified by Mr. Oldfield Thomas. No specimens of the animals marked † were obtained, but the notes may be of some interest :—

* The Mishmi Brown-toothed Shrew, *Soriculus baileyi*, Thomas.—Journal, B. N. H. S., Vol. XXII, p. 683. A new species.

* Sikkim Water Shrew, *Nectogale sikhimensis*, de Wint.—A dried skin containing the skull and most of the flesh was given me at Sanga Chöling by a man who saw I was interested in animals. This skin was said to have come from Karpo Valley (alt. about 12,000 feet). It was used as a kind of charm, which when rubbed lightly on swellings on horses was said to cure them, and for this reason was considered valuable.

* The Mishmi Chestnut Rat, *Epimys brahma*, Thomas.—Anzong Valley, Mishmi Hills, 6,000 feet, 3rd May 1913. A new species. Journal, B. N. H. S., Vol. XXIII, p. 231.

* The Woolly Hare, *Lepus oiostolus*, Hodgs.—Chumdakyang, 15,000 feet.

* The Greyish Woolly Hare, *Lepus oiostolus illuteus*, Thomas.—Kangsar Tsangpo Valley, Tibet, 10,000 feet, 12th August 1913. A new subspecies. Journal, B. N. H. S., Vol. XXIII, p. 232.

* Hodgson's Mouse-hare, *Ochotona curzoniæ*, Hodgs. Nyima La, Tibet, 27th August 1913, 15,000 feet.

Great Tibetan Sheep, *Ovis hodgsoni*, Blyth, were found in a few places. At Kye Kye in the Upper Char Valley we heard of them but did not see any. On the Nyala La, north-east of Tsöna we saw many, and Captain Morshead shot two and came on the carcass of one which had just been killed by wolves. On one hill near the Pass, herds of Kyang, Gazelle and *Ovis hodgsoni* were grazing mixed up together. They were also said to be found on the Tulung La south-east of Tsöna.

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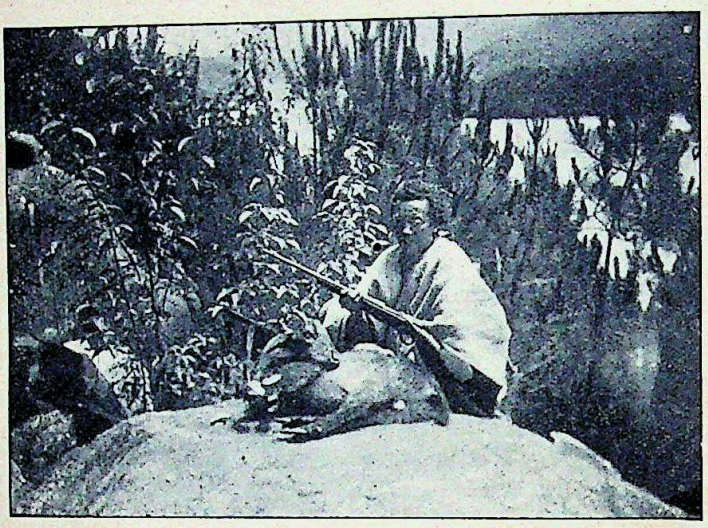
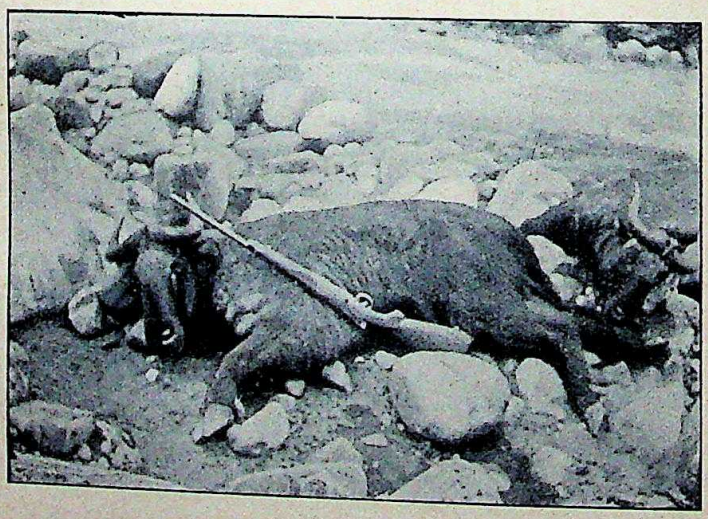


A.—NEW GORAL (*Nemorhædus baileyi*).



B.—YOUNG MALE TAKIN.

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Bharal, *Pseudois nayaur* † and Musk Deer *Moschus* sp ? † were common everywhere at suitable altitudes. The former were particularly numerous in the hills north-east of Tsöna. On one day's march I counted nine herds of Bharal, one of *Ovis hodgsoni* and three of Tibetan Gazelle.

* The Mishmi Goral.—*Nemorhœdus baileyi*, Pocock. A new goral which Mr. Pocock has described in Vol. XXIII, p. 32, of the Journal, was obtained in the Yigrong Valley. Goral of this colour were plentiful in the upper valleys of the Dibang. The skins, as well as that of the Serow, Takin, and bears, are used as coats by the inhabitants of Po Me. (Fig. A.)

Serow, *Capricornis* sp ?† of a dark roan colour are found in Po Me and in the Tsangpo Valley as far up as Shu (E. Long. 93°-25′). They were plentiful in the uninhabited country below Gyala. The imperfect skin of a Barking Deer was brought from Tang Me in Po Me which has been identified by Mr. Pocock as *Muntiacus lacrymans*. The common Barking Deer is very plentiful in the Dirang Valley and in the portion of Bhutan through which we travelled.

Tibetan Gazelle, *Gazella picticaudata*, Hodgs.† were common at suitable places, but there are none on the hills on either bank of the Tsangpo in its lower reaches in Kongbo. We first found them near Lhagyari and they were common in the country to the south of that place.

* Shou, *Cervus affinis*, Hodgs.—A specimen with horns in velvet was shot at Chösam in the district of Tsari at about 15,000 feet elevation on the 12th September 1913. Mr. Pocock's note on this specimen, which proved to be a young one, appeared in the "Field" for 3rd October 1914. The measurements were :—Head and body, 67½″; tail, 3″; ear, 8⅞″. Height at shoulder 46″. Others were seen south of the Tsari range on the marshy plain near Simoneri. In this part of Tibet this stag is very local in its range, and appears only to exist in the upper valleys in the holy district of Tsari: further down the valley at Migyitün (9,630 feet) the forest was very thick and we were told that the Shou was never found there. They occasionally cross the ranges into the valleys to the west, but do not stay there permanently. I found a pair of shed horns which measured 54″. A stag was said to occur in the forests on the hills above Pe in Kongbo Province and they are common at Gyamda, a town some distance north of our route which we did not visit. I saw horns in the villages of the Loro Karro Valley which were said to have come from the high bare country north of Tsöna, but stags had not been seen in this part of the country for many years, and we could hear nothing of them in the Dungkar Valley in the west, the only ground in the vicinity which appears suitable.

Takin, *Budorcas taxicolor*, Hodgs.—Inhabit the forest clad slopes, south of the Himalayan range, but do not cross to the north, though they penetrate some distance up the valleys of rivers which break through the range. There were horns in many villages in Pemakö and the animal is common here, especially in some valleys which flow into the Chimdro Chu from the north. We saw some small herds in the forests on the bank of the Tsangpo below Gyala, but they do not come further up the valley than that place. They are found in the valley of the Po Tsangpo as far upstream as Trulung, but not above that place and not in the valley of the Yigrong. We heard of them in the lower end of the Tsari Valley and in the valleys flowing from the range south of the Tsari river. Daflas, who crossed the Himalayas into the Chayul Valley, said that they were common in their country, but that there were none north of the watershed. They appear to migrate with great regularity at certain seasons. One of their routes is in the Anzong Valley (the main northern branch of the Dibang) up which they travel towards the end of May as soon as the melting snow allows them to reach the grassy clearings at the edge of the forest. Another well marked line of migration

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in the Dibang Valley is from the Andra Valley, north-west of the village of Mipi, across the hills to the Yongyap Valley which they cross and move to a hot spring somewhere in the valleys to the north-east. The natives say that at the end of May, the Yongyap Valley swarms with them, but they do not stay there long, and we ourselves passed through this valley before the arrival of these large herds. The Akas say they are plentiful in their country where they are called "Shugupan." The people of Po Me and Kongbo call them "Kyimyak" or "Tsimyak." One which I shot (Fig. B) was eating the bark of trees as he went along, leaving a regular blazed trail in places which was very easy to follow. In uninhabited country where they are seldom hunted they are very fearless of man until they get his wind, and natives say that they can sometimes walk boldly up to within a few yards of them.

Kyang, *Equus hemionus*† were seen on the Pu La (4th September) and the Nyala La (26th October). We saw no bears, but there are many on Po Me and the people are fond of wearing black bearskin coats. We saw stones turned over by bears on the glaciers which flow north from the great snow peak of Namcha Barwa, and they are found in valleys flowing into the Tsangpo at least as far upstream as Shu where the altitude of the river bed is about 10,000 feet. Here I saw in trees some branches bent together to form a kind of platform about three feet square on which they said the bears sat. These places were used every night and fresh droppings were on them and on the ground.

I saw monkeys† in the Yongyap Valley at about 9,500 feet. They are also found in the Lower Tsangpo Valley, at least as far up as Dowoka where the river bed is 9,500 feet and the monkeys are said to be in the forests high up on the hills. The only ones I saw in the Tsangpo Valley were near Gyala, where I saw a large flock among dry rocks and scrub jungle on the steep hillside. I saw one of these in captivity which appeared to have rather longer hair than the ordinary Bengal monkey, *Simia rhesus*, especially round the face. I also saw a flock in the Tsari Valley.

We saw wolves and foxes in many places; the former were occasionally in small packs, eleven being the largest number seen together. Near the Hor La (31st Oct.) the shepherds burn a circle of sheep's dung fires round their camps to scare these animals away.

We saw Marmots, *Marmot* sp ? † on several high passes. They had not hibernated by the beginning of October, but must have done so soon after.

Tigers† are found as far up the Dibang Valley as two marches beyond Mipi where I saw fresh tracks and the bones of one which had been killed a year previously.

Pig, *Sus* sp ?† are very common in the Upper Dibang Valley where they do considerable damage, and we sometimes saw hillsides ploughed up by them. The Mishmis call them Amwön.

Several snakes were seen in the Mishmi Hills and also in Pemakö. They are also said to be very plentiful in north-eastern Bhutan. Lizards were basking on the rocks and walls along the whole of our road up the Tsang Po Valley; they were also numerous in the Yigrong Valley in Po Me.

BIRDS.

The following birds collected were identified by Mr. Stuart Baker:—

Himalayan Jay, *Garrulus bispecularis*.—Chulikatta Mishmi name Jula. Etalin Dibang Valley, 8,000 feet. 7-2-13.

Yellow-billed Blue Magpie, *Urocissa flavirostris*.—Chema Chembo Rong Valley, Po Me, 7,000 feet. 7-7-13.

The Himalayan Nutcracker, *Nucifraga hemispila*.—Lower Yigrong Valley, 7,500 feet. 5-7-13.

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The Large-Spotted Nutcracker, *Nucifraga caryocatactes multipunctata.*—Etalin Dibang Valley, Mishmi Hills, 7,500 feet. 7-2-13.

The Green-backed Tit,—*Parus monticola.*—Dem Po Me, 8,000 feet. 29-6-13. La Yö Ting, Po Me, 8,000 feet. 8-7-13.

Hodgson's Fulvetta, *Proparus vinipectus.*—Tri Pe, 10,500 feet. 15-7-13. Nest hanging in a branch of bamboo ; nest of grass lined hair. Moss and lichen on the outside, 4 fresh eggs.

Prince Henry's Laughing Thrush, *Trochalopteron henricii.*—Shewa Po Me, 9,000 feet. 27-6-13. The only other specimen of this species is the type which is in the Paris Museum.

The Western Yellow-winged Laughing Thrush, *Trochalopteron nigrimentum.*—Nyuk Tsang, Lower Tsangpo Valley, 9,000 feet. 19-7-13.

Black-faced Laughing Thrush, *Trochalopteron affine.*—Tsu Valley, a branch of the Dibang Valley, Mishmi Hills, 7,500 feet. 15-3-13.

White-throated Laughing Thrush, *Garrulax albigularis.*—Lower Yigrong Valley, 7,500 feet. 5-7-13.

Great Tibetan Babbler, *Babax waddelli.*—Lutö, Lower Tsangpo Valley, 10,000 feet. 10-8-13.

Austen's Hill-Warbler, *Suya khasiana.*—Mipi, Dibang Valley, 4,800 feet. 11-5-13.

Bailey's Ixulus, *Ixulus flavicollis baileyi.*—Tembang, Drang Valley, 7,000 feet. 10-10-13.

A new sub-species described by Mr. Stuart Baker in the Bulletin of the British Ornithologists' Club, Vol. XXXV, p. 17. The locality is wrongly given with the description.

Dark-grey Bush-Chat, *Oreicola ferrea.*—Tsangrang in Pemakö, 4,500 feet. 18-6-13.

Himalayan Black Bulbul, *Hypsipites psaroides.*—Tong Me in Po Me, 7,500 feet. 1-7-13.

The Grey-backed Shrike, *Lanius tephronotus.*—Tibetan name Tre Tre, Showa, Po Me, 9,000 feet. 27-6-13.

Rufous-bellied Niltava, *Niltava sundara.*—La Yö Ting, Rong Valley, Po Me. 7,500 feet. 8-7-13. Nest of moss lined with roots on tree trunk 4 feet from ground, three eggs hard set.

Rufous-breasted Blue Flycatcher, *Cyornis hyper thrus.*—La Yö Ting, Rong Valley, Po Me, 7,500 feet. 8-7-13. Nest of moss hanging in a lump of moss on dead branch of a tree 4 feet from the ground, two fully fledged young birds.

The Little Blue-and-White Flycatcher, *Cyornis astigma.*—Sü Lungba, north of the Sü La in Po Me, 10,800 feet. 25-6-13. Nest of moss lined with fine moss and a little hair in a cleft in a tree 4 feet from the ground, four eggs hard set.

Yellow-bellied Flycatcher, *Chelidorhynx hypoxanthum.*—Sü Lungba N of Sü La in Po Me, 10,800 feet. 25-6-13.

Sooty Flycatcher, *Hemichelidon sibirica.*—Sü La, 11,000 feet 24-6-13.

Daurain Redstart, *Ruticilla aurorea.*—Nest of grass with moss outside, lined with hair and feathers on the ground under a rock. Three fresh eggs on 17-7-13 (only 2 on 16-7) Tri Pe, Lower Tsango Po Valley, 10,500 feet. 17-7-13. Blue eggs. Three eggs not quite fresh at Timpa, 10,000 feet. 5-8-13. Brown eggs.

Whit-collared Ouzel, *Turdus albicinctus.*—Gacha, Tsangpo Valley, 10,000 feet. 14-8-13.

Himalayan Greenfinch, *Hypacanthis spinoides.*—Dre Yigrong Valley, 7,500. 2-7-13.

Eastern Meadow Bunting, *Emberiza stracheyi.*—Gyadzong, Po Me, 7,500 feet. 2-7-13

The White-capped Bunting, *Emberiza stewarti.*—Tong Me in Po Me,

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7,500 feet. 1-7-13. Nest of grass lined with hair on the ground under a tuft of grass. 3 fresh eggs. These eggs were not identified with the bird, but Mr. Stuart Baker is of opinion that they are unmistakeable.

Black-naped Green Woodpecker, *Gecinus occipitalis*.—Showa, 9,000 feet. 27-6-13.

The Black Woodpecker, *Picus martius*.—Tongkyuk, Po Me, 8,500 feet. 9-7-13.

Common Indian Nightjar, *Caprimulgus asiaticus*.—Mipi, Dibang Valley, 4,800 feet. 13-5-13.

Hutton's Owlet, *Athene bactriana*.—Chumdakyang, 15,000 feet. 2-9-13.

Rufous Turtle Dove, *Streptopelia turtur orientalis*.—Tibetan name "Didigugu." Showa, Po Me, 9,000 feet. 28-6-13. These doves along with Parrots and Choughs do some damage to the crops in Po Me and boys are kept in the fields to scare them away.

Speckled Woodpigeon, *Dendroteron hodgsoni*.—Dem, Po Me, 8,000 feet. 29-6-13. Pe, 10,000 feet. 14-7-13. Numbers were seen in Po Me, and in the Lower Tsangpo Valley. Perches on trees in flocks of from 10 to 15.

Sclater's Monal, *Lohophorus sclateri*.—Tibetan name (Po Ba dialect) "Dong" Chulikatta Mishmi name Pui-Di. Common in the Upper Dibang Valley, and on both sides of the Yongyap La. Cocks weighed 5 lbs. in May. Is very noisy in the evenings. These birds when chased by a dog refused to fly until nearly caught when they would fly into a tree and remain there while the dog barked below. Our dog actually caught one. They were usually found in small flocks of two or three individuals. In Po Me Monal Pheasants are found, though no specimens were collected. It appears that both *L. sclateri* and another similar bird with a crest of long feathers are found together. This is probably *L. lhuysi*, but possibly *L. refulgens* and is called "Tse" by the Pobas. Monal Pheasants were also seen on the Se La and other places near Tawang, but no specimens collected.

Temmink's Tragopan, *Tragopan temmincki*—Tibetan name "Bop". Common in the Upper Dibang Valley and also in Po Me at suitable elevation. At the end of July several broods were seen in the Tsangpo Valley near Pemaköchung at altitudes between 7,500 and 9,500 feet. In the uninhabited region about here these birds were very tame and only moved a few yards off when disturbed. More than two or three were never seen together. Cocks weighed about 3½ lbs. in May. We were told that there were tragopans in the Tsari Valley and some were seen on the Tse La near Tawang; a specimen obtained here by Captain Molesworth is described as *Tragopan blythi molesworthi* by Mr. Stuart Baker in Vol. XXXV of the Bulletin of the British Ornithologists' Club, p. 18.

Kuser's Blood Pheasant, *Ithagenis kuseri*.—Tibetan names: Poba dialect, "Siri". Kong Bo dialect, "Seto". Siri is also the name given to *I. geoffroyi* which is found on the eastern Tibetan border. *I. cruentus* in the Chumbi Valley is called "Semo". Very common and confiding in the Upper Dibang Valley. Also common in Po Me. It lives at higher elevations than the Monal and Tragopan and was frequently seen on snow but, always in forest, and prefers dense undergrowth. Gathers together in flocks of ten to twenty. It does not fly readily. A nest was found in a depression on the ground under a bamboo at an altitude of 10,000 feet in the Upper Dibang Valley, at the end of April, which contained three fresh eggs of which Mr. Stuart Baker gives the following description:—"The eggs of *I. kuseri* are exactly like those of *I. geoffroyi* and are remarkably like weakly coloured specimens of those of the grey hen. The ground colour is a rather warm reddish buff and the whole surface is densely covered with speckles and small blotches of rich blood red. In one egg all these markings are very small with the exception of one large blotch near the smaller end. In the other egg there is a fairly well marked broad ring of

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rather large deeper coloured blotches than elsewhere round the centre of the egg. The texture is very hard, close grained and smooth, and there is a decided gloss. The eggs measure 46×32·2 and 45×32 mm. They are very true oval in shape." Some blood pheasants, probably of this species, were seen on the hills on the right bank of the Tsangpo below Pemakochung at about 11,000 feet. We were told that there were blood pheasants in the Tsari Valley. Blood pheasants were also seen on the Pöshing Poshinla La in Mönyul, probably *I. tibetanus*, described by Mr. Staurt Baker from a specimen obtained by Captain Molesworth (Bulletin of B. O. C., Vol. XXXV p. 18). The Mishmis trap the pheasants in their country and also the hill partridges (*Arboricola*) in the following way:—A light fence is made of twigs about 18 inches in height, usually along a contour of the hill in the forest. In this gates are kept open just wide enough to admit a bird, and in these openings a noose made of fine roots and fixed to a bent springy bamboo. The birds when feeding wander down to the fence and do not fly or hop over, but follow it until they reach one of the gates and the first bird to pass is usually caught.

Harman's Eared-pheasant, *Crossoptilon narmani*, Elwes.—Tibetan name, "Cha-nga". This bird occurs in Po Me, where I found feathers and scratchings, though I was never fortunate enough to come on the birds themselves. It is common in the Lower Tsangpo Valley in Tibet. The farthest point west at which we saw it was the east side, Putrang La, where there were numbers in the rhododendron scrub at about 15,500 feet. The lowest elevation at which we found this pheasant in the Tsangpo Valley was at about 9,300 feet at Gyala, but I saw traces of them in Po Me at about 8,500 feet. In the valley of the Tsangpo itself the highest point upstream at which we found these birds was the neighbourhood of Nang Dzong. They were plentiful in the valley of the Char, which is a branch of the Subansiri, but none were found west of the Pu La which is the watershed between the Tsang Po and Subansiri in this region. There were many on the Takar La and the Le La. They were heard calling near Natrampa on the Lower Chayul Valley, but they do not appear to extend west of these places. They were said to be common at Tsari in winter, but we saw none. These birds move about in flocks of about 5 or 10, and frequent forest-covered hills, and at higher elevations dwarf rhododendron jungle, where they feed on the grassy clearings among the bushes. They are very noisy in the early morning and less so in the evening. Their call is like that of *C. tibetanum*. When alarmed they usually fly into a tree; the flight is heavy and usually downhill. The beaters on seeing these birds would make a noise like the barking of dogs, on which the birds fly into a tree and are easily shot. They say that if they do not make this noise the birds fly a considerable distance. Broods of freshly hatched chicks were seen at Gyala, 10,000 feet on 18th July, while about the same time a specimen of a larger chick was shot. A well-grown young one was shot on the Putrang La on 24th August. These birds are trapped by Tibetans in the Lower Tsangpo Valley. Adult specimens in the flesh measured, males 31½, 33¾, 35¼ inches and females 34 and 34⅛ inches. This bird was first obtained by the late Lieut. Harman, R.E., through one of the Tibetan explorers and described by Mr. Elwes in 1881 from a single imperfect skin; he suspected that this skin had been obtained from the Lower Tsangpo Valley, but its exact habitat has not been known until now.

Common Hill Partridge, *Arboricola torqueola*.—Tibetan name, Sipung Lulu, Chulikatta Mishmi name, "Pao-Er": Nepaulese name "Peora". This bird was found in the Upper Dibang Valley at about 8,000 feet elevation. A juvenile specimen was obtained in Po Me at Trulung, 8,000 feet, on 6th July. Is always found in thick forest.

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Red-breasted Hill Partridge, *Arboricola mandellii*.—Chulikatta Mishmi name "Pao-Er". A specimen was obtained in the Upper Dibang Valley, 2,000 feet, on 14th January 1912.

The Tibetan Partridge, *Perdix hodgsoniæ*.—Tibetan names: Central Tibetan, Rhakpa; Eastern Tibetan, Sakpa; in Kongbo Tibetan, "Che Tra". Found in the crops in the Tsangpo Valley from Pe upwards. A good many broods of newly-hatched birds were seen in the beginning of August. They were also seen in the Chayul, Sömpu, and Upper Nyamjang Valley. They are found in flocks of from 10 to 15. Their flight is like that of an english partridge, but they are not so willing to rise; they are not very wild. When scattered they call each other with a curious buzzing sound. I once heard this exactly imitated by the creaking lid of a lunch basket which we had out shooting.

Tibetan Snow Cock, *Tetraogallus tibetanus*.—Tibetan name "Kongmo" or "Lhapcha" Kongmo. Takar La, 16,000 feet. 21-9-13. Was also seen at suitable heights all along the route traversed and was very numerous on the Druk La. This is a noisy bird and always calls when starting to fly. They invariably fly downhill and will run up a hill out of gunshot for quite a distance when it is impossible to overtake them. They live above the level of trees and shrubs, and I have seen them on snow. I have seen as many as 30 in a flock.

In addition to the specimens obtained a few other birds of interest were seen. In the Upper Dibang Valley there is a game bird called by Tibetans Shatama, but all efforts to secure a specimen were fruitless. This bird also is said to occur at Rinchenpung in Pemakö. In the Upper Dibang Valley another game bird which was never obtained is called Tong Yama by the Tibetans. Quail were seen in the Upper Dibang Valley and also below Rinchenpung. On the Sü La the pass south of Showa in Po Me some specimens of a small game bird called "Lhading" in Tibetan were seen, but the only one shot was lost under a snow drift. At Gyala I saw a bird on the wing which appeared to be like a Kalij, but could not shoot it. Another game bird which I made great, but unsuccessful, efforts to obtain is called "Kuling" in Tibetan. It is common on the Kongbo Nga and Putrang passes and also in the hills above Shu in the Tsangpo Valley.

Cormorants were seen on the Yigrong Lake in Po Me and also on the river at Tsela, where we also saw Mergansers. In the winter duck and barheaded geese are plentiful on the Yigrong Lake and also on the Tsangpo River. The ubiquitous Brahminy duck was seen at several places throughout the journey. Parrots were common in Po Me up to about 9,000 feet. There were also numbers in the Tsango Valley. We did not notice them higher upstream than the Kongbo Nga La where the altitude of the valley is about 10,600 feet, but they are occasionally seen a few miles farther up the valley.

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BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA, BURMA AND CEYLON.

REPORT Nos. 18 & 19.

(*With a Plate*).

BY R. C. WROUGHTON.

COLLECTION ... ... No. 18.
LOCALITY ... ... Ceylon.
DATE ... ... January-March 1914.
COLLECTED BY ... ... Major E. W. Mayor.
EARLIER REPORTS .. .. No. 1, E. Khandesh, Vol. XXI, p. 392, 1912; No. 2, Berars, Vol. XXI, p. 820, 1912; No. 3, Cutch, Vol. XXI, p. 826, 1912; No. 4, Nimar, Vol. XXI, p. 944, 1912; No. 5, Dharwar, Vol. XXI, p. 1170, 1912; No. 6, Kanara. Vol. XXII, p. 29, 1913; No. 7, Central Provinces, Vol. XXII, p. 45, 1913; No. 8, Bellary, Vol. XXII, p. 58, 1913; No. 9, Mysore, Vol. XXII, p. 283, 1913; No. 10, Khatiawar, Vol. XXII, p. 464, 1913; No. 11, Coorg, Vol. XXII, p. 486, 1913, No. 12, Palanpur, Vol. XXII, p. 684, 1913; No. 13, South Ceylon, Vol. XXII, p. 700, 1913; No. 14, Shan States, Vol. XXII, p. 710, 1913; No. 15, Kumaon, Vol. XXIII, p 282, 1914; No. 16, Dry Zone, Central Burma, and Mt. Popa, Vol. XXIII, p. 460, 1915; No. 17, S. Tenasserim, Vol. XXIII, p. 695, 1915.

This Report deals with the Collections representing the Fauna of Ceylon. A former Report, No. 13, by Miss Ryley, gave the results of a first collection from the Southern Province, but additional material since received has necessitated the re-examination of that material and in some cases a substitution of other names for those accepted by Miss Ryley. In these circumstances I have thought it most convenient to make this Report deal with the whole Island. Where there is no change of name the specimens are listed in lump under the heading "S. Ceylon". Where a species obtained in S. Ceylon is not represented in the new collection the species is entered but without a serial number.

The following short account of the physiography of the Island is compiled from the Imperial Gazetteer of India. There is a central mountain zone (Central Province) from which outwards there extends a broad fringe of plain which varies in width from 30 to 80 miles in the southern parts of the Island, but occupies very nearly half of its area in the north. In the extreme North, however, about Jaffna, the flats are quite recent, owing partly to elevation above the sea and partly to the accumulation of detritus washed down by strong southern currents from the Coromandel Coast and piled on to the Coral Reefs round Point Pedro.

The central mountains show groups of fantastic peaks and prominences, but, irregular as is their apparent configuration, there is a distinct tendency to a north-east to south-west strike about their main ridges.

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Except for the clearings for plantations and agriculture the whole Island is jungle-covered. At the higher elevations, up to 6,000 feet, the clearings are for tea, while in the low-lying coastal fringe rice cultivation is responsible for most of the open spaces. The northern half of the Island is a vast expanse of primæval forest, traversed by the great high road of the north with the branches to the ports of the eastern coast.

The following are Major Mayor's notes on his collecting stations:—

Urugalla, Central Province.—A small village, 21 miles east of Kandy. Elevation about 1,600 feet, but rising up to the Negatenne Gap, at 3,000 feet. The country comprises a series of hills—some running up to 1,000 feet above Urugalla—all heavily cultivated. Tea and Rubber Estates up to Negatenne, and round Urugalla large tracts of terraced rice-fields, interspersed with jungle, whilst the tops of the hills are covered with forest. Heavy mists morning and evening make it very difficult to dry the skins. Here, as elsewhere, the natives apparently eat everything they can catch; with the exception of one old Singhalese villager, they brought in no specimens, and I am certain visited my traps when located. It being just after the N.-E. Monsoon the villagers, according to the headmen, were helpless with malaria. I distributed about 500 (10-gr.) packets of quinine round this District.

Kandy and *Peradeniya*.—The former 1,654 feet, the latter 1,540 feet, above sea-level. The Director of Agriculture kindly gave me the use of an empty bungalow in the Royal Botanical Gardens. This I made my centre, trapping in the Gardens, and in the Experimental Gardens and the jungle on the other side of the Mhawala Ganja; also in the Lady Horton Reserve Forest on the hills above Kandy in which the Government Agent of Kandy kindly gave me permission to shoot. Loris and Flying Squirrels were reported to be in this part, but I saw neither, and could not get any specimens brought in by natives. The Gardens abound in Squirrels, mostly *F. palmarum*, and thousands of Flying Foxes, which are protected by the Garden authorities, as I presume they interest the crowds of Tourists who visit the beautiful Royal Botanical Gardens.

Pattipola, Central Province.—A village ¾ mile from Summit Level of the Railway (6,226 feet) between Kandy and Bandarawella. Very hilly, the lower slopes and valleys covered with coarse grass, interspersed with Rhododendron trees and bushes. The upper slopes, and tops of all the hills, are covered with a dense jungle of wind torn and twisted trees, smothered in moss and streaming bunches of lichen. The undergrowth is very thick, and mixed with bamboos running up to 8 feet or more in height.

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Unfortunately the "nillu"* was not in bloom. I was told it blooms once in every 7 or 10 years. When this occurs and the seeds drop all the small Rodents and Jungle Fowl come in thousands to feed on them, followed by the larger mammals. The rats, &c., literally kill themselves by overeating. I was told that one Nillu Season the rats died in such numbers on the banks of the lake at Newera Eliya—presumably the seed makes them very thirsty—that the Town was obliged to have them collected and buried by coolies. Very bad driving mists occur here and slight frosts in the early mornings. The noticeable thing in the up-country jungle, as compared with that in the low country, is the absolute stillness and silence and apparent lack of animal and bird life. Sambhar, locally known as "Elk," are very plentiful, and Elephants cross over Summit Level. I did not see one Bat whilst here—natives reported Bats in the Summit Level Tunnel, but on investigation I found them to be Swallows. These build the edible nests, and I was told the Chinese Emperor yearly sent men over to collect them.

Ambawela, Uva Province.—A group of Tea Estates about 5 miles east of the Bandarawella Railway Line. Elevation about 5,000 feet, with hills running 600 to 1,000 feet higher. The hill tops, generally covered with jungle, where not under tea. Lower slopes covered with coarse grass 3 or 4 feet long. Beyond here towards Hakgalla, one of the high peaks of Ceylon, the country is open and hilly Patnas† jungles, on the tops and on the banks of the various "Ellas."

There is practically no population, except the coolies on the various Tea Estates.

Kala Oya—On the Anuradhapura and Putlam Road, on the Kala Oya River, dividing the North-Central and North-West Provinces. Elevation about 140 feet. Country flat and covered with a thick thorny and cactus treed jungle, about 20 feet high, the only good trees along the River banks. North of this and in both Provinces is a large Game Sanctuary, the Forest Guards of which said they had never seen Flying Squirrels and rarely the *M. vitticollis*. The Leopard is common about here. The Wet Season is in the N. E. Monsoon.

Mannar, Northern Province.—Is nearly at the end of the Railway line under construction from Madawachchi on the Jaffna and Anura-

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* "Nillu" *Strobilanthes sp.*, an allied form is common on the Western Ghats of Bombay. Herds of Cattle are taken long distances to areas where the 'Karvi' has seeded, and become very fat.

† Patnas Jungle—H. H. W. Pearson has a most interesting paper on the nature and origin of these Jungles ("Botany of the Ceylon Patanas." Journ. Linn. Soc. xxxiv., p. 300, 1898-1900). He says "The tree vegetation of the Uva patanas is represented by comparatively few individuals, belonging to two species, viz. :—*Phyllanthus emblica* (up to 3,000′) and *Careya arborea* (3,000′—4,500′)".

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dhapura Line to Talli-Mannar, the new Port for the coolies from S. India. A small Town practically on the S. W. end of an Island 18 by 3 miles. The country is flat, 12 inches above sea level, and covered with a low scrub, practically dried up in the Spring and Summer. It seemed impossible to get anything but a few musk-rats and squirrels. There were many bats in the buildings of the old Dutch Fort, but one could not get at them as the ceilings were boarded or canvassed over and the bats got between this and the tiled or Cadjan roof, they flew in and out at dusk. The fishermen here get several dugong during the year, in their nets, the flesh is eaten, as are Flying Foxes which are considered to be a dainty dish.

Cheddikulam, Northern Province.—A very small village, with one small boutique, 37 miles inland along the Railway Line from Mannar. The country is flat, with a thick, thorny jungle, interspersed with trees running up to 50 feet high. There is a big Tank near the Village with some good timber trees, this is a favourite haunt for Macaques, but they are very shy. There are large troops of Langurs but they are even more shy than at Mankeni, owing to the excessive shooting and poaching that goes on all round. The Tamils shoot and eat anything. On my arrival a Tamil brought up three live Gerbils, he refused 25 cents and took them away to eat. The Jungle is as hard to move about in as elsewhere in Ceylon. The natives here all keep dogs for hunting. I saw 5 men who had between them 17 dogs on leads. This of course makes the game, &c., very scarce.

Mankeni, Eastern Province.—A Forest Bungalow on the Batticaloa and Trincomalee Road, 28 miles from the former, and about 150 yards from the Seashore. The surrounding jungle, which comes up close to the Bungalow, is very thick evergreen in which it is impossible to move about, or see anything, except along a very few native cart-tracks and jungle paths. Though there was plenty of animal sport about, animals, except Jackals, are rarely seen. The place abounds with Langurs and Macaques, but they will allow no one to approach within 100 yards of them. We noticed here Monkeys sleeping at noon, they were lying on their backs along the boughs, with their arms and legs hanging down on each side.

Trincomalee, Eastern Province.—There is no jungle nearer than 2 miles. There are Bats in Fort Augustus, but the arrival of the N. E. Monsoon made collecting impossible.

Major Mayor desires to record his obligation to the Director of Agriculture, who gave him the use of an empty bungalow in the Royal Botanic Gardens as head-quarters; to the Government Agent of Kandy who allowed him to shoot in the Lady Horton Reserve, on the hills above Kandy; to the Assistant Government Agent, Mannar, Mr. Harrison Jones, for hospitality and help; and to Messrs.

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H. M. Drummond Hay and Wallis Wilson who gave him all assistance and much valuable information, and also hunted the surrounding country for him with their pack of Elk Hounds.

The present collection comprises 941 specimens belonging to 59 Species in 39 Genera.

Quite a number of these species are known as peculiar to Ceylon, *e. g.*, *Pithecus pileatus*, *Loris tardigradus*, *Pachyura montana* and *P. kandiana*, *Paradoxurus aureus*, *Mungos flavidens*, *Ratufa macroura*, *Gunomys gracilis*, *Axis ceylonensis*, *Sus zeylonensis*, *&c.* It has been a great desideratum to obtain modern, well made, and measured specimens of these as a basis for comparison in dealing with the S. Indian Fauna.

With three groups, viz., *Ratufa macroura*, *Funambulus palmarum* and *Epimys* "*rattus*," it has been possible, with some confidence, either to apply existing names, or where such were not available to give new ones to divergent forms.

But the most unexpected result of the Survey has been the discovery of a new Murine Genus, linking in a way the Genera *Mus* and *Epimys*, represented by two quite distinct species.

If we have any members in Ceylon who desire to help, I would call their attention specially to the South-Western extension of the Central Mountain Cluster. Several most interesting specimens, including *Cœlomys bicolor*, were taken at Udugama and Kattawa. Some years ago, in dealing with the Genus *Tatera*, I founded a species on a specimen in the National Collection.. I have been unable to match it among all the specimens in this Collection, which are *cuvieri* and have very long feet and tails, while *ceylonica*, Wroughton, is characterised by the exact reverse.

(1) PITHECUS PILEATUS, Shaw.

The Toque Monkey.

(Synonymy in No. 13.)

♂ 2, Maha Oya ; ♂ 6, ♀ 1, Mankeni ; ♂ 2, in al. 1, Cheddikulam ; ♀ 1 (skeleton only) in al. 1, Panadura ; in al. 1, Kesbawa ; ♂ 1, in al. 2, Raygam ; ♂ 1, Tammannewa ; ♂ 1, Kala Oya, S. Ceylon, ♂ 1, ♀ 4.

(2) PRESBYTIS URSINUS, Blyth.

The Bear Monkey.

1852. *Presbytis ursinus*, Blyth, J.A.S.B., XX, pp. 155, 182.
1888. *Semmopithecus ursinus*, Blanford, Mammalia No. 19.

♂ 2, Pattipola ; ♀ 1, in al. 1, Hakgall.

"These do not appear to be very numerous in the hilly country. They are very shy and extremely difficult to approach. If come upon suddenly, at close quarters, however, they keep perfectly still and then their dark bodies and white whiskers blend absolutely with the twisted boughs covered with moss and lichens. I only saw one which was conspicuously black, but was informed that at lower elevations, between 1,500 and 3,000 feet they are smaller and blacker."—E.W.M.

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PRESBYTIS CEPHALOPTERUS, Temm.

The Purple-faced Monkey.

S. Ceylon, ♀2.

(3) PRESBYTIS PRIAMUS, Blyth.

The Madras Langur.

(Synonymy in No. 13.)

♀1, Asugam Bay; ♂2, ♀12, Mankeni; ♂3, Valaichenai; ♂6, ♀3, in al. 1, Cheddikulam; ♀2, in al. 1, Kala Oya; ♂2, ♂1, Tammannewa; ♀1, (Juv.), Ambawela; 1, Bambarra bottuwa; S. Ceylon, ♂3, ♀3.

(4) LORIS TARDIGRADUS, L.

The Slender Loris.

1766. *Lemur tardigradus*, Linnæus, Syst. Nat., p. 44.
1796. *Loris gracilis*, Geoffroy, Mag. Encyc. An 4e, p. 48.
1888. *Loris gracillis*, Blanford, Mammalia No. 27.

♂1, Mannar; ♂1 (juv.) ♀1, Anuradhapura; ♂1, Willichia; ♀1, Tammannewa.

(*See* also Report No. 11.)

These are topo types of Linnæus' species, and will be useful in dealing with the mainland forms, when occasion serves.

"Rarely seen and hard to obtain. They are reported round Kandy, but I never heard of them at any higher altitude. They were also reported in lower Uva, and a Planter told me that two had been obtained in his Cocoanut Estate in Lower Eastern Province. I only obtained them at Anuradhapura and round Kala Oya, on the borders of the N. C. and N. W. Provinces."—E.W.M.

(5) PTEROPUS GIGANTEUS, Bruenn.

The Common Flying Fox.

(Synonymy in No. 2.)

♀1, Valaichenai; ♂4, ♀1. Cheddikulam; ♂1, Peradeniya.

(*See* also Reports 2, 3, 4, 5, 7, 8, 9, 10, 12 and 15.)

"Flying Foxes are plentiful in certain parts but most at Peradenia Gardens, Kandy. There they swarm in thousands, absolutely covering the trees they are feeding on and making an astonishing noise with their wings, as, when frightened, they rise in black clouds in the air. They have locally an edible value and sell for as much as 35 cents each."—E.W.M.

(6) ROUSETTUS SEMINUDUS, Kel.

The Ceylon Fruit Bat.

1850. *Pteropus seminudus*, Kelaart, J.A.S. Ceyl., II., p. 329.
1891. *Xantharpyia amplexicaudata*, Blanford, Mammalia No. 137 (partim)

♂1, ♀1, Urugala; ♂2, ♀24, in al. 4, Kandy, S. Ceylon, ♂1.

(7) CYNOPTERUS SPHINX, Vahl.

The Southern Short-nosed Fruit Bat.

(Synonymy in No. 6.)

♂3, ♀13, in al. 4, Urugala; in al. 2, Ambawela; ♀4, Noitchigama; ♂1, ♀5, in al. 3, Tammannewa; 1, Kala Oya; ♀9, in al. 5, Anuradhapura; S. Ceylon, ♂1.

(*See* also Reports Nos. 9, 11, 13, 14 and 15.)

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(8) RHINOLOPHUS ROUXI, Temm.

The Rufous Horseshoe Bat.

(Synonymy in No. 5.)

♂1, ♀1, in al. 1, Maha Oya. South Ceylon, ♂1, in al. 8.

(*See* also Reports Nos. 6, 9, 13 and 15.)

(9) RHINOLOPHUS BEDDOMEI, K. And.

The Great Indian Horseshoe Bat.

(Synonymy in No. 6.)

♀1, in al. 3, Kala Oya.

(*See* also Report No. 11.)

(10) HIPPOSIDEROS BRACHYOTUS, Dobs.

The Dekhan Leaf-nosed Bat.

(Synonymy in No. 6.)

♂3, ♀1, in al. 3, Kala Oya.

(*See* also Report No. 12.)

(11) HIPPOSIDEROS DUKHUNENSIS, Sykes.

Sykes Leaf-nosed Bat.

(Synonymy in No. 5.)

♂1, ♀1, in al. 2, Samarakella; ♂2, Valaichenai; ♂4, ♀1, in al. 11, Mannar; ♂3, in al. 9, Tammannewa; ♀1, in al. 1, Kala Oya; ♂2, ♀14, 1, in al. 9, Trincomalee; ♂2, ♀1, in al. 15, Anuradhapura; S. Ceylon, ♂20, ♀21, in al. 5.

(*See* also Reports Nos. 6, 8, 9, 11 and 13.)

(12) HIPPOSIDEROS FULVUS, Gray.

The Bicoloured Leaf-nosed Bat.

(Synonymy in No. 3.)

♂3, ♀5, in al. 7, Valaichenai; ♂5, ♀1, in al. 5, Trincomalee; ♂4, in al. 1, Anuradhapura. S. Ceylon ♀1.

(*See* also reports Nos. 5, 6, 7, 8, 9, 10, 12, 13, 14, 16 and 17.)

(13) MEGADERMA SPASMA TRIFOLIUM, Goeff.

The Malay Vampire Bat.

(Synonymy in No. 5.)

♂2, ♀3, Mankeni; ♂1, Panichikankeni; in al. 2; Samarakella; in al. 1, Trincomalee; S. Ceylon ♂1, ♀2.

(*See* also Reports Nos. 6, 11, 16 and 17.)

By an oversight the S. Ceylon specimens were published as *Lyroderma lyra*.

PIPISTRELLUS COROMANDRA, Gray.

The Coromandel Pipistrel.

(Synonymy in No. 5.)

S. Ceylon, ♂1, ♀1.

(*See* also Reports Nos. 9, 11, 13, 14 and 15.)

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(14) PIPISTRELLUS MIMUS, Wrought.

The Southern Dwarf Pipistrel.

(Synonymy in No 1.)

♀1 (juv.) in al. 1, Kandy; S. Ceylon ♂4, ♀5, in al. 5.

(*See* also Reports Nos. 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15 and 16.)

(15) SCOTOPHILUS WROUGHTONI, Thos.

Wroughton's Bat.

(Synonymy in No. 1.)

♂1, ♀1, Anuradhapura.

(*See* also Reports Nos. 5, 6, 7, 9, 10, 11, 12, 15, 16 and 17.)

(16) HESPEROPTENUS TICKELLI, Blyth.

Tickell's Bat.

(Synonymy in No. 5.)

♂2, ♀2, Anuradhapura.

(*See* also Report No. 6.)

MINIOPTERUS SCHREIBERSI, Kuhl.

The Long-winged Bat.

(Synonymy in No. 13.)

S. Ceylon ♂2, in al. 8.

(17) LEUCONŒ HASSELTI, Temm.

Van Hasselt's Bat.

1840. *Vespertilio hasselti*, Temminck. Mon. Mamm. II, p. 225.
1891. *Vespertilio hasselti*, Blanford, Mammalia No. 203.
♀1, Valaichenai; ♂2, ♀2, Kokoputchi; ♀1, Anuradhapura.

(18) TAPHOZOUS CRASSUS, Blyth.

The Pouch-bearing Sheath-tailed Bat.

(Synonymy in No. 6.)

♂2, Gangodawila.

(19) PACHYURA sp.

Shrews.

♂6, ♀2, in al. 1, Mannar; ♀1, Colombo; ♂6, ♀9, in al. 2, Kandy.

(*See* also Reports Nos. 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 15, 16 and 17.)

(20) PACHYURA KANDIANA, Kel.

The Kandy Shrew.

1852. *Sorex kandianus*, Kelaart, Prodr., p. 30.
1888. *Crocidura murina*, Blanford, Mammalia No. 117 (partim).
♀2, Kandy. S. Ceylon ♀1.

Among the musk shrews from Kandy are two specimens of a very dark colour which answer closely to Kelaart's description of *kandianus*, and I

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have therefore so listed them here. It is doubtful how far colour is a character of specific value in these animals. There are several more specimens in the series which much resemble these two but are coloured differently, provisionally I have included these under the head "*Pachyura sp.*" above. A third specimen was taken at Wellawaya and listed by Miss Ryley under *Pachyura sp.*

(21) PACHYURA MONTANA, Blyth.

The Ceylon Highland Shrew.

1851. *Sorex montauss*, Blyth, J.A.S.B. XX, p. 163.
1888. *Crocidura murina*, Blanford, Mammalia No. 117 (partim).
♂ 2, Pattipola; ♂ 2, 1 in al. 1, Ambawela; S. Ceylon ♀ 1.

Kelaart sent two specimens to Blyth under the MS. name *montanus*. Blyth, by publishing the name with a short description, no doubt unwittingly, forestalled Kelaart's publication of the name in the following year in his Prodromus. These specimens I think undoubtedly represent this species with both descriptions of which they entirely agree. A specimen was also taken at Udugama and listed in Report 13 under the general head *Pachyura sp.*

(22) FELIS PARDUS, L.

The Panther.

(Synonymy in No. 5.)

♂ 1, Ambawela; ♀ 1, Kala Oya. S. Ceylon ♀ 1.

(*See* also Reports Nos. 6, 9, 11, 13, 14 and 16.)

(23) FELIS VIVERRINA, Benn.

The Fishing Cat.

1833. *Felis viverrina*, Bennett. P.Z.S., p. 68.
1836. *Felis viverriceps*, Hodgson, J.A.S.B., V., p. 233.
1837. *Felis himalayanus*, Jardine, Nat. Lib., p. 230.
1888. *Felis viverrina*, Blanford, Mammalia No. 35.
♂ 1, Maha Oya.

Some years ago, in dealing with the African Bush Cats, I came to the conclusion that the specific name *serval*, usually applied to them, belonged to the present species (A.M.N.H., p. 205, 1910). I have now been into the whole question again and Mr. Thomas has convinced me that it is better to leave things as they were originally. The name *Felis serval* was given on a plate published by Schreber in 1776, which was practically a reproduction of one published in 1765 by Buffon. Whatever Buffon described, and personally I am confident that it was our Indian Fishing Cat, the specific name must go to the animal represented by Schreber's plate. In that picture the large ears, set close together on the head, and the markedly ringed tail are certainly not characters of *viverrina*, and so there is ample excuse for leaving the name *serval* with the Cape Cat for which it has been used for so many years.

(24) FELIS AFFINIS, Gray.

The Jungle Cat.

(Synonymy in No. 1.)

♂ 1, Cheddikulam.

(*See* also Reports Nos. 3, 4, 5, 6, 7, 10, 11, 12, 15 and 16.)

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(25) FELIS RUBIGINOSA, Geoffr.

The Rusty-Spotted Cat.

(Synonymy in No. 5.)

♂ 1, Ambawela; ♀ 1, Hakgalla, S. Ceylon ♂ 2.

(*See* also Report No. 13.)

FELIS (domestic).

1 melano, Yatiyantota; ♂ 1, Ambawela.

The Yatiyantota specimen is merely an melano of the common domestic cat, and not of *affinis*, as supposed by the donor.

(26) VIVERRICULA MALACCENSIS, Gmel.

The Small Indian Civet.

(Synonymy in No. 3.)

♂ 4, in al. 1, Maha Oya; ♂ 2, Mankeni; ♂ 2, Cheddikulam; ♂ 1. Pattipola; ♂ 2, Tammannewa; S. Ceylon ♂ 3.

(*See* also Reports Nos. 5, 7, 10, 11, 12, 13, 15 and 16.)

(27) PARADOXURUS NIGER, Desm.

The Indian Toddy Cat.

(Synonymy in No. 5.)

♂ 1, Tammannewa; S. Ceylon ♂ 2, ♀ 1.

(*See* also Reports Nos. 7, 8, 11, 13 and 15.)

(28) PARADOXURUS AUREUS, F. Cuv.

The Ceylonese Palm Civet.

1822. *Paradoxurus aureus*, F. Cuvier, Mem., Mus., Hist., Nat., IX., p. 48.
1852. *Paradoxurus zeylanicus*, Kelaart, Prod., p. 39.
1888. *Paradoxurus aureus*, Blanford, Mammalia No. 53.
♀ 1, Maha Oya.

(29) MUNGOS LANKA, Wrought.

The Common Ceylon Mungoose.

1808. *Herpestes mungo*, Blanford, Mammalia No. 60 (partim).
1915. *Mungos lanka*, Wroughton, Journ. B. N. H. S. XXIV., p. 53.
♂ 1, Mannar; ♂ 1, Kala Oya; ♀ 2, Tammannewa.

(*See* also Reports Nos. 2, 3, 4, 5, 7, 8, 9, 10, 11 and 15.)

This is no doubt the Ceylon representative of *Mungos mungo*, but in sorting out the races of that species recently (l. c.) it became evident that the Ceylon form required a new name.

"I did not get any of these until I got to the N. and N. W. Provinces. *M. smithi* and *M. flavidens* being most common. In my experience the *M. vitticollis* is very scarce or extremely wary and shy. From evidence of white and native residents it is rarely seen. The latter say that when it goes out it is always protected by the other mongoose who warn it of any danger."—E.W.M.

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(30) MUNGOS SMITHI, Gray.

The Ruddy Mongoose.

(Synonymy in No. 7.)

♂ 1, ♀ 1, Mankeni; ♂ 1, Kirinda; ♀ 1, Kala Oya; S. Ceylon ♂ 3, ♀ 4.

(*See* also Reports Nos. 12 and 13.)

(31) MUNGOS FLAVIDENS, Kel.

The Ceylon Brown Mongoose.

(Synonymy in No. 13.)

1, Yatiyantota; ♂ 2, Pattipola. S. Ceylon ♂ 1, ♀ 2.

(32) CANIS INDICUS.

The Common Indian Jackal.

(Synonymy in No. 3.)

♂ 1, Asugam Bay; ♂ 4, ♀ 1, Mankeni.

(*See* also Reports except Nos. 2, 8, 13 and 17.)

"Jackals are common everywhere, but I obtained and saw most in the Eastern Province."—E.W.M.

(33) LUTRA LUTRA, L.

The Common Otter.

(Synonymy in No. 11.)

♀ 1, Newera Eliya.

(*See* also Report No. 15.)

"They appear to be in most of the rivers, also in the Lake at Kandy. Most plentiful I should say in the trout streams, round Newera Eliya, where the river Keepers shoot several every year."—E.W.M.

(34) MELURSUS URSINUS, Shaw.

The Sloth Bear.

(Synonymy in No. 11.)

♂ 1, Delagowella; S. Ceylon, ♂ 1.

PETAURISTA LANKA, Wrought.

The Large Grey Flying Squirrel.

(Synonymy in No. 13.)

S. Ceylon ♂ 1, ♀ 1.

PTEROMYS (PETINOMYS) LAYARDI, Kel.

The Small Ceylon Flying Squirrel.

1850. *Sciuropterus layardi*, Kelaart, J. A. S. Ceyl. Vol. II, p. 328.
1890. *Sciuropterus fuscocapillus*, Blanford, Mammalia No. 237 (partim).
S. Ceylon, ♀ 1.

This is the animal listed in Report No. 13 as *Sciuropterus fuscocapillus*, Bl. Since then Miller has shown that the name *Pteromys* must replace *Sciuropterus*. The type of *layardi* Kelaart is in the National Collection and though in bad condition is sufficient to establish that this specimen is *layardi*. The type of *fuscocapillus* is apparently lost, and the only thing I have to repre-

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sent it is a mutilated flat skin collected by Mr. Bourdillon in Travancore. Kelaart in his description of *layardi* says "beneath gray," while Blyth writes of *fuscocapillus* "Under parts rufous white extending to the cheeks and under lip, the lateral fur margining the membrane rufo fulvous." There is sufficient of Mr. Bourdillon's specimen to show that the fur of the cheeks and of the line joining side and membrane (and indeed all fur on lower side of membrane) is buffy, growing paler near the base, whereas in *layardi* and in the present specimen the hairs of the underside are dark slate grey with pale points. The fringe on outer edge of membrane would seem to be much more developed in *layardi* than in *fuscocapillus*.

(35) RATUFA MACROURA, Penn.

Pennant's Long-tailed Squirrel.

1769. *Sciurus macrourus*, Pennant, Ind. Zool., I., pl. 1.
1777. *Sciurus ceylonicus*, Erxleben, Syst. R. A. Mamm, p. 416.
1785. *Sciurus ceilonensis*, Boddaert, Elench. Anim., I., p. 117.
1849. *Sciurus tennanti*, Blyth., J. A. S. B., XVIII., p. 600.
1852. *Sciurus montanus*, Kelaart, Prodr. Faun. Zeyl, p. 50.
1891. *Sciurus macrurus*, Blanford, Mammalia No. 241.
♂3, ♀1, Pattipola (Alt. 6210).

Some years ago I published an account (Journ. B. N. H. S., Vol. XIX, p. 880, 1913) of these Ceylon Giant Squirrels. These four specimens show that I was completely misled by the poor material available for examination. What I then identified as true *macroura* now proves to be without a name and in a joint paper (p. 36, *ante*). Mr. Thomas and myself have given it the subspecific name *melanochra*. The two specimens from Kattowa listed by Miss Ryley (Report No. 13) as *R. macroura* must bear the name *R. macroura melanochra*. They are distinguishable at a glance from true *macroura* by the absence of the white tips to the hairs of the tail ; in *melanochra* the tail is entirely black.

"All the Giant Squirrels are commonly known as "Rock Squirrel" probably derived from the word "Ruk" which in Sinhalese means "tree.' They are very agile and among the gnarled and twisted trees of the hill jungles are very hard to obtain. Their flesh is much appreciated by both Sinhalese and Tamils."—E.W.M.

(36) RATUFA MACROURA DANDOLENA, Thos. & Wr.

The Common Ceylon Giant Squirrel.

1891. *Sciurus macrurus*, Blanford, Mammalia No. 241.
1915. *Ratufa macroura dandolena*, Thomas and Wroughton, Journ. B. N. H. S., Vol. XXIV, p. 36.
♂6, ♀7, Maha Oya ; ⚥1, Arugam Bay ; ♂5, ♀10, Mankeni ; ♀1, Valaichenai ; ♀1, Cheddikulam ; ⚥2, ♀2, Kala Oya ; ⚥2, ♀2, Tammannewa ; ♀1, Anuradhapura ; S. Ceylon ⚥3, ♀4.

In Report No. 13, Miss Ryley, following my paper of 1910, listed this form as *R. macroura tennenti*, but as explained by Mr. Thomas and myself earlier in this Volume (p. 36), the name *tennenti* must fall as a synonym of *macroura*, and the S. Ceylon specimens as well as the present series must take the name at the head of this note.

RATUFA MACROURA MELANOCHRA, Thos. & Wr.

The Black and Yellow Giant Squirrel.

1915. *Ratufa macroura melanochra*, Thomas & Wroughton. Journ. B. N. H. S., Vol. XXIV, p. 36.
S. Ceylon ♀2.

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(37) FUNAMBULUS LAYARDI.

Layard's Striped Squirrel.

1849. *Sciurus layardi*, Blyth, J.A.S.B., XVIII., p. 602.
1891. *Sciurus layardi*, Blanford, Mammalia No. 255.
♂1, ♀1, Ratnapura.

"These are the rarest of the small squirrels, and the hardest to obtain, as they frequent the tops of tall trees and their colouring protects them. The Taxidermist of the Colombo Museum, who obtained these specimens, told me they were the first for nearly 30 years."—E.W.M.

(38) FUNAMBULUS KATHLEENÆ, Thos. & Wr.

The Ceylon Dusky-striped Squirrel.

1891. *Sciurus sublineatus*, Blanford, Mammalia No. 256.
1914. *Funambulus trilineatus*, Ryley (nec Blyth) Journ. B.N.H.S., Vol. XXII, p. 708.
1915. *Funambulus kathleenæ*, Thomas & Wroughton, Journ. B.N.H.S., Vol. XXIV, p. 38.
♀3, ♀2, Pattipola; ♀1, in al. 1 Ambawela; ♂1, Bambarabottuwa. S. Ceylon ♂1, S. Ceylon ♂1.

The S. Ceylon specimen from Kottawa was listed by Miss Ryley in Report No. 13 under the name *trilineatus*. That name however is technically preoccupied and the name *kathleenæ* is now substituted (*vide* p. 38, *ante*).

"Not so common as I expected in the hill jungles and very hard to see. They do not make an incessant noise like *palmarum*, and are consequently difficult to locate."—E.W.M.

(39) FUNAMBULUS PALMARUM BRODIEI, Blyth.

The Northern Ceylon Palm Squirrel.

1849. *Sciurus brodiei*, Blyth, J.A.S.B., XVIII, p. 602.
1891. *Sciurus palmarum*, Blanford, Mammalia No. 253 (partim).
♂2 Mannar; ♂10, ♀11, Cheddikulam.

(40) FUNAMBULUS PALMARUM OLYMPIUS, Thos. & Wr.

The Highland Ceylon Palm Squirrel.

1891. *Sciurus palmarum*, Blanford, Mammalia No. 253 (partim).
1915. *Funambulus palmarum olympius*, Thomas & Wroughton, Journ. B.N.H.S., Vol. XXIV, p. 41.
♂13, ♂8 Urugalla; ♂2, ♀2, Kandy; ♂1, ♀2, Peradeniya; ♂2, ♀1, in al. 1, Ambawela.

(41) FUNAMBULUS PALMARUM KELAARTI, Lay.

The Lowland Ceylon Palm Squirrel.

1850. *Sciurus kelaarti*, Layard, J.A.S.B., XX, p. 166.
1891. *Sciurus palmarum*, Blanford, Mammalia No. 253 (partim).
♂5, ♀1, Patticola; ♂7, ♀5, Mankeni; ♀1, Welimada; ♂5, ♀8, in al.1, Kala Oya; ♂2, ♀3, in al.1, Tammannewa; ♂2, ♀3, Putlam; ♂4, ♀1, Anuradhapura; ♂2, Trincomalee. S. Ceylon ♂17, ♀9.

FUNAMBULUS PALMARUM FAVONICUS, Thos. & Wr.

The Submontane Ceylon Palm Squirrel.

1891. *Sciurus palmarum*, Blanford, Mammalia No. 253 (partim).

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1915. *Sciurus palmarum favonicus*, Thomas & Wroughton, Journ. B. N. H.S., Vol. XXIV, p. 39.
S. Ceylon ♂9, ♀10.

These specimens obtained at Kottawa, Udugama and Ranna in the north of the S. Province were provisionally listed as *palmarum* by Miss Ryley in Report 13. On receipt of Major Mayor's further collections it became evident that these represented a distinct geographical race inhabiting the outliers of the main central mountain mass.

(42) TATERA CUVIERI, Waterh.

The South Indian Gerbil.

1838. *Gerbillus cuvieri*, Waterhouse, P. Z. S., p. 56.
1891. *Gerbillus indicus*, Blanford, Mammalia No. 264 (partim).
♂7, ♀7, Maha Oya; ♂4, ♀7, Mankeni; ♀2, Colombo; ♂1, Kala Oya; S. Ceylon, ♂16, ♀26, in al. 1.

It will be noted that all these specimens, including those from S. Ceylon, are from the low coast country. Miss Ryley overlooked the name *cuvieri* or perhaps did not care to use it until material from S. India was available. These specimens have tails nearly two inches longer than typical *indica* and that is the most marked character of *cuvieri*. Whether as Blanford states, intermediates exists is as yet doubtful, but should they be found we may have to treat *cuvieri* as a mere geographical race, but for the present it is more convenient to treat it as a separate species. The type of *cuvieri* was from Arcot.

In dealing with the Genus *Tatera* some years ago (A.M.N.H., XVII, p. 474, 1906), I established a new species *ceylonica* on a specimen presented to the British Museum by Kelaart, characterised by its shorter hind feet and markedly shorter tail. Presumably this is the highland form, of which there is no representative in the present collection.

(43) MUS MANEI, Kel.

The Ceylon House Mouse.

1851. *Mus manei*, Kelaart, Prod. Faun. Zeyl., p. 64.
1891. *Mus musculus*, Blanford, Mammalia No. 282 (partim).
♂1, ♀1, Maha Oya; ♀5 in al. 3, Kandy; ♂7, ♀13, in al. 4, Cheddikulam: ♀1 Colombo; ♂11, ♀9, in al. 2 Urugalla; in al 2 Peradeniya; ♂2, ♀1, in al. 1 Ambawela; ♀2, in al. 1, Tammannewa; ♂2 Anuradapura; ♂3, ♀1, Trincomalee; ♂2, ♀1, in al. 1, Nugagalla Estate. South Ceylon ♂8, ♀5 in al. 5.

As explained in Report No. 3 Gray gave the name without a description to one of Elliot's specimens and it was only in 1852 that Kelaart gave the description from a Ceylon specimen. These specimens are therefore topo-types of *M. manei*.

(44) MUS BOODUGA, Gray.

The Southern Field Mouse.

(Synonymy in No. 1.)

♂3, ♀5, in al. 6, Maha Oya; ♂7, ♀19, in al. 8 Mankeni; in al 1 Mannar; ♂2, Valaichenai; ♂3, ♀2, in al 3 Cheddikulam; ♂7, ♀4, Urugalla; in al. 4, Kala Oya; S. Ceylon ♂6, ♀10, in al. 7.

(*See* all Reports except Nos. 3, 14, 17.)

These do not seem to differ from the adjoining mainland form.

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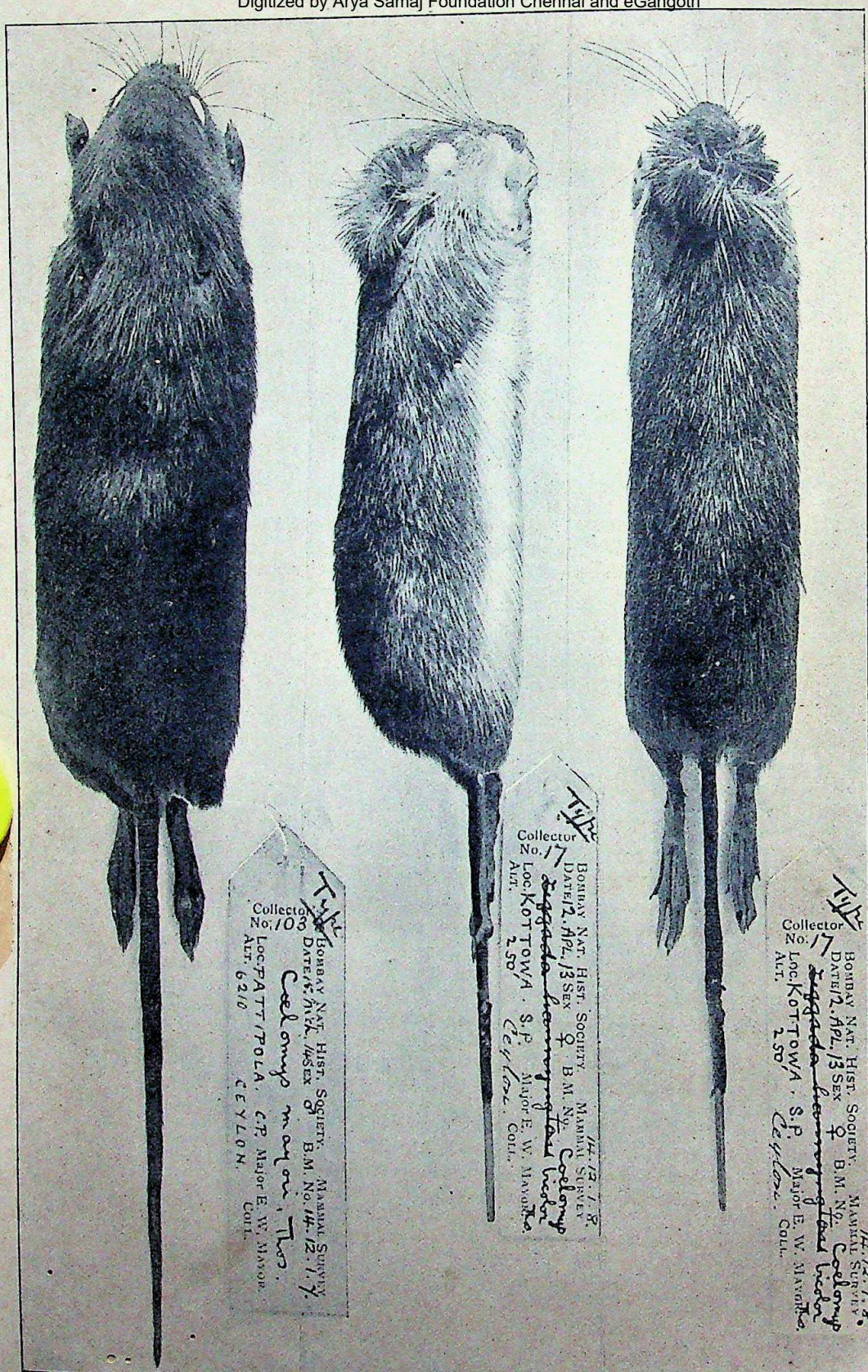

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Cœlomys mayori, Thos., and *bicolor*, Thos., from Ceylon.

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(45) CŒLOMYS MAYORI, Thos.

Mayor's Rat.

1915. *Cœlomys mayori*, Thomas, Journ. B.N.H.S., Vol. XXIII, p. 416.
♂6, ♀10, in al. 2, Pattipola.

A medium sized rat, bearing a strong outward resemblance to *Millardia*. Brown with a faint ochraceous grizzling; grey below. Head and body about 4 inches, tail 3½ inches.

CŒLOMYS BICOLOR, Thos.

The Bicoloured Cœlomys.

1915. *Cœlomys bicolor*, Thomas, Journ. B.N.H.S., Vol. XXIV, p. 49.
S. Ceylon ♀1.

This animal was listed in Report 13 as *Leggada hannyngtoni*, an animal which it very closely resembles exteriorly. When the skull was cleaned, Thomas decided that it was a second species of *Cœlomys, i.e.*, the lowland representative of *mayori*.

(46) EPIMYS NEMORALIS, Blyth.

The Ceylon Large Tree Rat.

1851. *Mus nemoralis*, Blyth, J.A.S.B., XX, p. 168.
1891. *Mus rattus*, Blanford, Mammalia No. 272 (partim).
♂2, ♀3, Mannar; ♂4, ♀9, Kandy; ♂3, ♀8, Trincomalee; S. Ceylon ♂9, ♀5, in al. 2.

The type of *nemoralis* is in the National Collection. Blyth's description is very incomplete. He compares it with "*M. setifer*, Horsfield," which is a Malay Bandicoot and says "with a considerably longer tail, exceeding the head and body in length, in the proportion of 5 to 4." The species is in fact the Ceylon representative of what in these Reports has been called "*rufescens*." If ultimately it is found not to differ from *rufescens*, Blyth's name will fall, but comparing the types I believe it is unlikely, and I think it most convenient to list it under a name which most certainly belongs to it.

(47) EPIMYS KANDIANUS, Kel.

The White-bellied Tree Rat.

1850. *Mus kandianus*, Kelaart, J.A.S. Ceyl., Vol. II., p. 326.
1891. *Mus rattus*, Blanford, Mammalia No. 272 (partim).
♂8, ♀9, in al. 2, Maha Oya; ♂2, ♀1, Valaichenai; ♀1, Cheddikulam; ♂3, ♀7, in al. 1, Urugalla; ♀1, Nagagala Estate; ♂2, ♀1, in al. 5, Kandy; ♂1, ♀1, Tammannewa, in al. 2, Mankeni; in al. 2, Peradeniya, S. Ceylon ♂24, ♀25, in al. 2.

The common house rat of Ceylon, corresponding to the white-bellied variety of *rufescens* on the mainland.

(48) EPIMYS KELAARTI, Wr.

Kelaart's Rat.

1891. *Mus rattus*, Blanford, Mammalia No. 272 (partim).
1915, *Epimys kelaarti*, Wroughton, Journ. B. N. H. S., Vol. XXIV, p. 48.
♂16, ♀25, in al. 7, Pattipola; ♂1, ♀15, in al. 5, Ambawela.

Kelaart in his Prodromus indicated but did not name this species. It is recognisable by its very long fur and dirty white under surface, the bases of

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the hairs being usually grey. The tail is proportionally shorter than in *kandianus*. The general colour above is darker than in *kandianus* and the admixture of buff or fulvous in the coat is very small.

(49) GUNOMYS GRACILIS, Nehr.

The Ceylon Mole Rat.

1850. *Mus dubius*, Kelaart (nec Hodgson), J. A. S. Ceyl., V., p. 217.
1891. *Nesocia bengalensis*, Blanford, Mammalia No. 295 (partim).
1902. *Nesokia gracilis*, Nehring. S. B. Geo. nat. Fr. Berl., p. 116.
♀ 2, Urugala ; ♂ 1, ♀ 1. Tammannewa ; ♀ 1, Kandy.

Not externally differing markedly from *G. kok* ; rather smaller in size and with markedly smaller teeth.

(50) BANDICOTA MALABARICA, Shaw.

The Malabar Bandicoot.

(Synonymy in No. 5.)

♂ 1, Urugala ; ♀ 2, Ambawela. S. Ceylon ♀ 2.

(*See* also Reports Nos. 6, 7, 9, 10, 11, 12 and 13.)

In my paper on the Bandicoots (Journ. B. N. H. S. XVIII, p. 750) I came to the conclusion that the Ceylon form was not distinguishable from that of the Malabar Coast. I see nothing in the present specimens to alter my opinion.

"By no means plentiful, which is largely due to the fact that the natives persistently dig them out for food ; they even took some out of my traps."—E.W.M.

MILLARDIA MELTADA, Gray.

The Soft-furred Field Rat.

(Synonymy in No. 1.)

S. Ceylon ♂ 8, ♀ 14, in al. 1.

(*See* also Reports Nos. 3, 4, 5, 7, 10, 11 and 13.)

I can find nothing by which to distinguish these specimens from typical *meltada* from the Southern Mahratha Country. They were all taken in the low coastal land of the S. Province, and Major Mayor obtained no more in his further collections.

(51) GOLUNDA NEWERA, Kel.

The Newera Eliya Bush Rat.

1850. *Golunda newera*, Kelaart, P.Z.S., p. 152.
1891. *Golunda ellioti*, Blanford, Mammalia No. 299 (partim).
♂ 1, ♀ 3, in al. 1, Pattipola ; ♂ 1, Ambawela.

Kelaart described a species, *newera*, from Newera Eliya, and a second, *coffœa*, from Kandy. Of the latter there are two specimens, named and presented by Kelaart, in the National Collection. These are more richly coloured than any specimens received from the mainland, but do not seem to differ in their skulls from *ellioti*. Of the former Kelaart gives the dimensions as head and body 3½", tail 2½". The specimens collected by Major Mayor are more than three quarters as big again. Nevertheless it is almost inconceivable that there should be two species living close together in these high altitudes, and I fairly confidently label our specimen as *G. newera*.

G. newera, as represented by this series differs from typical *ellioti* by its much finer grizzling (the yellow tips of the hairs are probably not more than

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1/3 the length of those in *ellioti*, and generally darker colouring. The size is the same as in *ellioti*, but the skull is larger and the molars longer.

Dimensions of an adult male (the figures in brackets are those of a male of about the same age from Dharwar) :—Head and body, 147 (150) ; tail 119 (120) ; hindfoot 26 (26) ; ear 16 (16).

Skull :—Greatest length 34 (31) ; molars 7 (6).

Judging from Kelaart's specimens *coffæa* is a much brighter coloured animal not differing greatly from a specimen of *ellioti* from Coorg. Major Mayor obtained no specimen of this species whose head quarters are at Kandy—Kelaart calls it the "*Coffee Rat*."

"Only two of these were actually got in the jungle. The ♂ was shot running up a tree to its nest, which was about 20 feet from the ground and the ♀ was trapped a few days later. The others were trapped in hedges and compound boundaries, and one was caught by hand by the side of a Tea Factory."—E.W.M.

(52) HYSTRIX LEUCURA, Sykes.

The Indian Porcupine.

(Synonymy in No. 1.)

♂ 1, Mankeni ; in al. 1, Yatiyantota ; ♂ 1, ♀ 4, in al. 1, Tammannewa.

(*See* also Reports Nos. 2, 5, 10, 11, 12 and 15.)

"Common everywhere, especially in the west of the N. C. Province. The natives sell the quills to the Moormen for making fancy boxes."

(53) LEPUS NIGRICOLLIS SINGHALA, Wrought.

The Ceylon Hare.

1915. *Lepus nigricollis singhala*, Wroughton, Journ. B.N.H.S., Vol. XXIV, p. 41.

1891. *Lepus nigricollis*, Blanford, Mammalia No. 319 (partim).

♂ 4, ♀ 2, in al. 1, Tammannewa ; ♂ 1, Hakgalla ; juv. 1, Ambawela ; S. Ceylon ♂ 5, ♀ 2.

A geographical race of *nigricollis* from which it differs most markedly by its buffy cheeks and the almost complete absence of the grey patch on the rump so noticeable in true *nigricollis*.

"Plentiful all over the Island. From weights taken personally and those given me by various sportsmen, I should say there is no great difference in size between the Up and Low Country hares."—E.W.M.

(54) MUNTIACUS MALABARICUS, Wr.

The South Indian Muntjac.

1891. *Cervulus muntjac*, Blanford, Mammalia No. 362 (partim).

1915. *Muntiacus malabaricus*, Wroughton, Journ. B.N.H.S., Vol. XXIV, p. 45.

♂ 1, ♀ 1, in al. 1, Tammannewa ; in al. 1, Ambawela.

The specimens very much resemble a specimen from Kanara which itself only differs from *malabaricus* (from Coorg) by the pale colour of its limbs and the presence of considerable white areas on the inner side of the limbs. Until we know more of the West Coast Muntjac I rank these as *malabaricus*.

(55) AXIS AXIS CEYLONENSIS, Fitz.

The Ceylon Spotted Deer.

1874. *Axis maculata ceylonensis*, Fitzinger, Sitz. K. A. Wiss. Wien., Vol. LXX, p. 269.

1891. *Cervus axis*, Blanford, Mammalia No. 368 (partim).

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1905. *Cervus* (*Rusa*) *axis zeylanicus*, Lydekker, Field., Vol. IV., p. 947.
♀1, Mankeni; ♀1. Valaichenai; ♂1, ♀ 2, in al. 2, Cheddikulam; ♂2, Sanctuary.

As the name already exists and has been accepted by Lydekker in his "Catalogue of the Ungulates" I use it here. The majority of the specimens show a very marked mixture of "drab" in the ground colour, two specimens from Mankeni however scarcely show it at all.

(56) RUSA UNICOLOR, Bechst.

The Sambhar.

(Synonymy in No. 5.)

♀1, Urugala.

(*See* also Reports Nos. 11 and 15.)

(57) TRAGULUS MEMINNA, Erxl.

The Indian Chevrotain.

♀3, Tammannewa; ♀3, in al. 2, Cheddikulam; S. Ceylon ♂1.

(*See* also Reports Nos. 11 and 13.)

Apparently identical with the Indian Mouse Deer.

(58) SUS ZEYLONENSIS, Blyth.

The Ceylon Wild Pig.

1851. *Sus zeylonensis*, Blyth, J.A.S.B., XX., p. 173.
♀1, Mankeni.

The specimen is a young sow, but so far as can be judged, the last molar is not quite up, the skull fully shows the characters laid down by Blyth (*viz.*, excessively narrow vertex and palate, and stout broad posterior molars) except in the length which however might increase with age.

(59) MANIS CRASSICAUDATA, G. St. Hel.

The Indian Pangolin.

(Synonymy in No. 3.)

♂1, Kala Oya. S. Ceylon ♂1.

(*See* also Reports Nos. 6, 8, 9, 11 and 13.)

REPORT No. 19.

BY R. C. WROUGHTON.

COLLECTION ... ... No. 19.
LOCALITY ... ... Bengal, Bihar and Orissa.
DATE ... ... May-September, 1914.
COLLECTED BY ... ... Mr. C. A. Crump.
EARLIER REPORTS ... ... No. 1, E. Khandesh, Vol. XXI, p. 392, 1912; No. 2, Berars, Vol. XXI, p. 820, 1912; No. 3, Cutch, Vol. XXI, p. 826, 1912; No. 4, Nimar, Vol. XXI, p. 944, 1912; No. 5, Dharwar, Vol. XXI, p. 1170, 1912; No. 6, Kanara, Vol. XXII, p. 29, 1913; No. 7, Central Provinces, Vol. XXII, p. 45, 1913; No. 8, Bellary, Vol. XXII, p. 58,

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1913; No. 9, Mysore, Vol. XXII, p. 283, 1913; No. 10, Kathiawar, Vol. XXII, p. 464, 1913; No. 11, Coorg, Vol. XXII, p. 486, 1913; No. 12, Palanpur, Vol. XXII, p. 684, 1913; No. 13, South Ceylon, Vol. XXII, p. 700, 1913; No. 14, N. Shan States, Vol. XXII, p. 710, 1913; No. 15, Kumaon, Vol. XXIII, p. 282, 1914; No. 16, Dry Zone, Central Burma and Mt. Popa, Vol. XXIII, p. 460, 1915; No. 17, S. Tenasserim, Vol. XXIII, p. 659, 1915; No. 18, Ceylon, Vol. XXIV, p. 79, 1915.

The collections dealt with in this Report were made in the southern part of the Province of Bengal (old style). They represent the Fauna of the Palamau, Hazaribagh and Singbhum Districts of Bihar and Orissa and the Midnapore District of Bengal. The larger number of the specimens is from various places on the Chota Nagpur Plateau and the remainder from the lower ground of Palamau in the West and Midnapur in the East.

Mr. Crump has furnished the following notes on the places visited by him.

"*Daltonganj.*—The head quarters of Palamau District, situated on the Amanat River, which flows northward to the R. Sone.

Chainpur.—Native Territory, West of the river and a few miles from Daltonganj. The soil is poor and cultivated areas alternate with barren tracts. There is much bamboo jungle on undulating ground and low hills. In Chainpur itself there are plenty of planted trees such as Mango and Fig, but the surroundings, except for patches of scrub jungle, are generally bare. On the stony ground 'Palas' (*Butea frondosa*) trees are numerous and yield Shellac, produced by the Lac insect which breeds on the trees.

Hazaribagh.—The town lies at an altitude of 2,000 feet, on a small plateau of about 500 sq. miles, being part of the Chota Nagpur Plateau.

Barkagaon.—A small village immediately below the southern boundary of the Hazaribagh Plateau towards Ranchi. The low ground is almost entirely given over to Rice cultivation, with scarcely a hedge or tuft of grass to give cover to any mammals. The neighbouring sandstone hills are covered with bastard Sal and quite destitute of undergrowth.

Jagodih.—A village near a range of low hills, running across the North of Hazaribagh District. This is part of the Chota Nagpur Plateau and lies some miles to the North of the little Plateau of Hazaribagh, a big dip occurring between them. The rock here is Gneiss and Micaceous Schists, with a large proportion of Quartz. A jungle of very poor Sal is mixed with dense thorny undergrowth, and, excepting the few large trees which have been spared for superstitious reasons, heavy timber does not exist. 'Mowa' (*Bassia latifolia*) trees are plentiful and yield a large supply of fruit, which when fallen is collected for commerce by the natives. Below the large

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tank I found a small piece of really respectable jungle in which I obtained the two specimens of *Viverricula*, but mammals of any description were difficult to find.

Lohra.—About 8 miles North of Jagodih, situated among the hills above mentioned. The forest here is better, having a greater proportion of large trees, but these are always more or less isolated. Several of the rich Mica mines existing in this Range, are in the neighbourhood, with the result that the ground is strewn with small glittering particles, which, when driven by a strong wind, cause much discomfort.

Gajhundi.—On the E. I. Railway and to the East of Lohra. Conditions as in Jagodih and Lohra.

Singar.—Is about 8 miles N. W. of Gajhundi, in the Gaya District. The village lies in a wide valley, surrounded by lofty granite hills clothed with dense scrub jungle. The Sal here has attained greater girth than any observed in this neighbourhood and, in places, forms quite good forest. Mammals too were more abundant.

Nimiaghat.—Situated at the eastern extremity of the Chota Nagpur Plateau, in the Hazaribagh District, adjoins the western slopes of Pareshnath Hill. These are clothed with scrub jungle, including much stunted Sal. To the South the ground is flat and divided up into endless paddy-fields, with here and there a low jungle covered hill rising abruptly from the plain. Tanks abound and contained plenty of water even just before the Monsoon burst.

Pareshnath Hill.—A mountain of several craggy peaks, rising solitary from a vast, almost flat plain, and reaching an altitude of 4,477 feet above sea level. The view from the summit is very impressive. The highest peak is occupied by a Jain Temple, and numbers of smaller temples are placed on a ridge immediately below, otherwise the mountain is uninhabited. The slopes, except for a few open, grass covered spaces, near the summit, are densely wooded. During the hot weather, surface water is exceedingly scarce, but half way down the side I noticed a more abundant supply.

Chaibassa.—The headquarters of the Singbhum District of Bihar and Orissa.

Sangajata.—Thirty miles West of Chaibassa, in the Santara Forest. It is situated in a spacious valley and surrounded by heavy Sal forest and densely wooded hills, with a dense tangle of underwood and creepers, which makes an excellent cover for all animals. The principal rock of these hills is laterite while the sub-soil is composed of clay schists; quartz appears on the surface in some quantity. No cultivation is attempted on the hillsides, which are all clad with forest and strewn with stones and

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boulders. In the valley Rice is cultivated though in quantities barely sufficient for home consumption, all the Kols however augment their larders with jungle fruits, roots and herbs. During the rains they subsist chiefly upon mushrooms. The Kols appear to be a very cheerful tribe, easy to get on with and always appreciating a joke. Most of the men carry bows and arrows and are rather keen shikaris, the pea fowl seem to know this for they were almost unapproachable.

Luia.—A small village on the river Dro and about 6 miles from Sangajata. The surroundings are similar to those of Sangajata, but there is more heavy jungle in the valley. The best ground for collecting purposes and the piece of jungle where I obtained the Giant Squirrels are on the opposite side of the River, which was often in flood. During the rains the jungle here is extremely dense, the undergrowth being particularly difficult to get through.

Midnapur.—Headquarters of the Midnapur District of Bengal, it is situated about a hundred miles West of Calcutta. The small area collected over is all laterite, very flat and adjoining the Gangetic plain. The surrounding forest is mostly stunted Sal, with practically no thorny undergrowth, the surface being clothed with a short close grass which, I understand, disappears soon after the monsoon. The cultivation is Rice."

Mr. Crump mentions the following animals which he has good reason to believe are present, but which he failed to obtain, *viz. Tupaia, Felis bengalensis, Viverra, Hystrix, Tragulus.* The failure to procure specimens of *Tupaia* and *Hystrix* is especially regrettable. Perhaps some local Member of the Society will help to fill in these gaps. A large Rhinolophine Bat with a conspicuous noseleaf is known to live in this area, but since the type specimen was obtained has not again been recorded.

The collection contains 1,024 specimens, besides a dozen collected and presented by Maj. O. A. Smith. The whole represents 57 species and sub-species in 39 genera. There is nothing strikingly new to report, indeed such was not to be expected, for this part of India has naturally been one of the best known. But many of the specimens will be most valuable when it comes to working out the genera in detail as being representative of Types which either have disappeared or are not available for examination.

The specimens of *Mungos mungo* have thus enabled me to sort out the Geographical races of the Common Mongoose throughout India, similarly we have now undoubted representatives of *Petaurista oral, Bandicota elliotana, Lepus ruficaudatus*, &c.

Maj. O. A. Smith claims, I understand, that there is a *Canis* in these parts, which though smaller than the Indian Wolf (*pallipes*) is distinct from the Jackal (*indicus*). Mr. Thomas examined

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specimens some time ago, but could find nothing in support of the theory and the specimens in the present collection seem to me to be true Jackals.

From the point of view of distribution it is interesting to note how closely the Chota Nagpur Plateau is linked with the Central Provinces as shown by the *Petaurista* and *Ratufa* both of them genera which are very sensitive to local changes of conditions.

Mr. Crump desires to acknowledge the hospitality and assistance given him by the following gentlemen :—Messrs. T. Luby, I.C.S., E. Lister, I.C.S., H. E. Tiery, B. C. Sen, R. Kirkpatrick, W. B. Thompson, I.C.S., Leo Faulkner, D.S.P.

(1) PITHECUS RHESUS, And.

The Bengal Monkey.

(Synonymy in No. 7).

♂2, ♀2, Luia.

(*See* also Reports Nos. 14 and 15.)

"Observed only at Luia, Singbhum, where they are shy and difficult to approach, owing to the thick undergrowth. Eventually the villagers, turning out in force, surrounded and treed the Monkeys. I obtained a few specimens, but in the general excitement, into which the Kols entered thoroughly, they let the only two large males escape."—C.A.C.

(2) PRESBYTIS ENTELLUS, Dufr.

The Langur.

(Synonymy in No. 1.)

♂2, Lohra; ♂5, ♀4, Midnapur.

(*See* also Reports Nos. 2, 4, 7, 10 and 12.)

"Is plentiful in the small State of Chainpur but is protected. In parts of the Hazaribagh District the Langur appears to be remarkably scarce. I met with only four individuals two of which were secured. A few reside on Pareshnath Hill, but these enjoy the privilege of rigid protection. In the Santara Range, Singbhum, the Langur is well distributed, though, so far as I could judge, not very abundant. Langurs are persecuted by the Jumsara tribe, who kill them for food, and by the Kols, who do not hesitate to let fly an arrow at any Langur threatening their crops, consequently they have retired to the thickest forest and are excessively wary, seldom venturing into the open. I made a number of attempts to secure specimens but the noise of my struggles through the undergrowth always scared the Langurs long before I came near them."—C. A. C.

(3) PTEROPUS GIGANTEUS, Bruenn.

The Common Flying Fox.

(Synonymy in No. 2.)

(*See* also Reports Nos. 3, 4, 5, 7, 8, 9, 10, 12, 13, 15, 18 and 19.)

♂9, ♀2, Nimiaghat ; ♂1, ♀2, Luia ; ♀1, Salbani.

"Occurs at Chainpur where it is protected. A few were seen flying over Barkagaon, Singar, Luia and Sangajata, but at Nimiaghat they were plenti-

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ful. The man sent to the roosting place to obtain specimens brought all males, the females I shot during the evening flight, which points to the sexes roosting apart."—C.A.C.

(4) CYNOPTERUS SPHINX, Vahl.

The Southern short-nosed Fruit Bat.

(Synonymy in No. 6.)

♂ 2, Barkagaon ; not sexed 6, Sangar, Gaya.
♀ 1, Luia ; ♀ 1, Koira ; ♀ 1, Salbani.

(*See* also Reports Nos. 9, 11, 13, 14, 15 and 18.)

"At Barkagaon and Singar specimens were obtained from Palmyra palms, which are favourite resorts for this species during the day."—C A.C.

(5) RHINOLOPHUS LEPIDUS, Bl.

The Little Indian Horseshoe Bat.

(Synonymy in No. 6.)

Not sexed 5, in al. 7., Singar, Gaya ; ♀ 1, Nimiaghat ; ♂ 1, Luia : ♂ 2, ♀ 3, Salbani.

(*See* also Reports Nos. 7, 15 and 16.)

"During the day found only in the coolest situations, they speedily die in captivity. They often enter lamp-lit rooms, but even then are not easy to take so quick are they on the wing."—C.A.C.

(6) HIPPOSIDEROS BRACHYOTUS, Dobs.

The Dekhan Leaf-nosed Bat.

(Synonymy in No. 6.)

1, Singar, Gaya.

(*See* also Reports Nos. 12 and 18.)

(7) HIPPOSIDEROS FULVUS, Gray.

The Bicoloured Leaf-nosed Bat.

(Synonymy in No. 3.)

In al. 1, Lohra ; ♂ 4, ♀ 3, Nimiaghat ; ♀ 2, Sangajata.

(*See* also Reports Nos. 5, 6, 7, 8, 9, 10, 12, 13, 14 16, 17 and 18.)

"Similar in habits to *Rhinolophus*. Frequently lives in Porcupine earths."—C.A.C.

(8) LYRODERMA LYRA, Geoff.

The Indian Vampire Bat.

(Synonymy in No. 1.)

♂ 11, ♀ 14, Nimiaghat ; ♂ 9, ♀ 10, Sangajata ; ♂ 6, ♀ 7, in al. 2, Salbani.

(*See* also Reports Nos. 4, 5, 6, 7, 8, 9, 12, 14 and 15.)

"Invariably congregates in large numbers and the sexes usually keep apart. Caves, bungalows, hollow trees and particularly disused wells are favoured by this species. I have never found any other species associating with it."—C.A.C.

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(9) PIPISTRELLUS CEYLONICUS, Kel.

Keluart's Bat.

(Synonymy in No. 1.)

♀1, Luia.

(*See* also Reports Nos. 2, 3, 5, 6, 8, 9, 10, 11, 12 and 14.)

"Shot over heavy jungle."—C.A.C.

(10) PIPISTRELLUS COROMANDRA, Gray.

The Coromandel Pipistrel.

(Synonymy in No. 5.)

♀2, 1, Jagodih; ♂1, ♀1, 4, in al. 1, Singar; ♀2, in al. 1 Nimiaghat; ♂1, Sangajata; ♂2, ♀2, Luia; ♂2, ♀8, in al. Koira; ♂18, ♀22, in al. 3, Salbani.

(*See* also Reports Nos. 9, 11, 13, 14 and 15.)

(11) PIPISTRELLUS MIMUS, Wrought.

The Southern dwarf Pipistrel.

(Synonymy in No. 1.)

♀1, in al. 1, Lohra; 1, Gajhundi; ♀1, 8, in al. 11, Singar, Gaya; ♂1, in al. 1, Nimiaghat; 1. in al. 1, Jagodih; ♂2, ♀3, in al. 3, Luia; ♂6, ♀19, in al. 18, Koira; ♂7, ♀9, in al. 25, Salbani; in al. 1, Calcutta.

(*See* also all previous Reports except Nos. 4, 14, 16 and 17.)

"These little bats (including *coromandra*) are generally difficult to find because of their habit of squeezing into small crevices for protection during the day. In the evening they are early on the wing, and with their slow and high flight are a fairly easy mark for the gun. During the day they appear to rest singly or in pairs. Many of these specimens were netted as they emerged from under the bungalow tiles and a large number of those from Koira were caught in the thatch roofs of the houses."—C.A.C.

(12) SCOTOZOUS DORMERI, Dobs.

Dormer's Bat.

(Synonymy in No. 1.)

♂1, ♀4, 6 Singar, Gaya; ♀2, Nimiaghat; ♂3, Koira.

(*See* also Reports Nos. 2, 3, 5, 7, 8, 10 and 12.)

We have so far always listed this Bat as a Pipistrel, but recently Thomas has decided to recognise it as a separate Genus. (Journ., B.N.H.S., Vol. XXIV, p. 33.)

(13) SCOTOPHILUS WROUGHTONI, Thos.

Wroughton's Bat.

(Synonymy in No. 1.)

♂5, ♀18, in al. 3, Daltonganj; in al. 1, Barkagaon; ♀1, Jagodih; ♂5, ♀6, in al. 3, Lohra; ♂11, ♀5, 5 Singar, Gaya; in al. 3, Calcutta; ♂12, ♀7, in al. 5, Salbani.

(*See* also Reports Nos. 5, 6, 7, 9, 10, 11, 12, 15, 16, 17 and 18.)

"This Bat is not partial to houses if it can find a convenient Palmyra palm, where it often congregates in large numbers, usually separate from other species."—C.A.C.

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(14) SCOTOPHILUS KUHLI, Leach.

The Common Yellow Bat.

(Synonymy in No. 1.)

In al. 1, Barkagaon; ♂ 12, ♀ 6, in al. 5, Nimiaghat; ♂ 1, Koira; in al. 2, Nimiaghat.

(*See* also Reports No. 3, 5, 6, 7, 9, 12, 14, 15 and 16.)

"This is essentially a bat of towns and villages. It may be found under the tiles or in the thatch of any Dak Bungalow, where, owing to its unpleasant smell and habits, it is an unmitigated nuisance. It emerges early. It breeds in May and June generally producing twins."—C.A.C.

(15) HESPEROPTENUS TICKELLI, Blyth.

Tickell's Bat.

(Synonymy in No. 5.)

♂ 2, ♀ 1, Koira.

(*See* also Reports Nos. 5, 6 and 18.)

"Shot over water late in the evening, flight rapid. The flesh colouring on and bordering the humerus, radius, ulna and metacarpals very bright when the bat was freshly killed, but soon faded after death."—C.A.C.

(16) TAPHOZOUS CRASSUS, Blyth.

The Pouch-bearing Sheath-tailed Bat.

(Synonymy in No. 6.)

♂ 1, Koira.

(*See* also Report No. 18.)

"A powerful flier."—C.A.C.

(17) TAPHOZOUS KACHHENSIS, Dobs.

The Cutch Sheath-tailed Bat.

♀ 1, Singar, Gaya.

(*See* also Reports Nos. 3, 8, 9, 10, 12 and 16.)

"This single specimen was shot over water. It is a very late flier."—C.A.C.

(18) TAPHOZOUS LONGIMANUS, Hardw.

The Long-armed Sheath-tailed Bat.

(Synonymy in No. 6.)

♀ 1, in al. 1, Nimiaghat; ♂ 2, ♀ 1, Salbani.

(*See* also Reports Nos. 7, 8, 9, 12 and 16.)

(19) RHINOPOMA KINNEARI, Wrought.

The Greater Indian Mouse-tailed Bat.

(Synonymy in No. 3.)

♂ 2, ♀ 1, Gajhundi.

(*See* also Reports Nos. 4 and 10.)

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(20) RHINOPOMA HARDWICKEI, Gray.

The Lesser Indian Mouse-tailed Bat.

(Synonymy in No. 3.)

♂1, ♀4, Singar, Gaya.

(*See* also Reports Nos. 5, 7, 8, 10 and 12.)

"Most of these specimens (including *kinneari*) were shot during flight, which is high and late in the evening. They are gregarious and here inhabited old, discarded mica mines, where searching was difficult and even dangerous."—C.A.C.

(21) PACHYURA sp.

♂7, ♀5, 7, Daltonganj; ♀1, Gajhundi;
♂2, ♀3, Singar, Gaya; ♂4, ♀5, in al. 3, Nimiaghat;
♀1, Paresnath: ♀2, Sangajata; ♂1, ♀1, in al. 2, Luia;
♀2, Koira; ♂1, Midnapur; ♂2, ♀1, Salbani.

(22) PACHYURA MICRONYX, Blyth.

The Kumaon Pigmy Shrew.

(Synonymy in No. 15.)

♂7, ♂8, Luia.

"These shrews were caught in the fields and under grass stacks near the villages. The lateral gland is large and oval and the tail of the average male is very thick at the base."—C.A.C.

(23) PACHYURA HODGSONI, Jerd.

The Darjeeling Pigmy Shrew.

(Synonymy in No. 15.)

♂1, Sangajata; ♂2, ♀7, Luia; ♂1, ♀1, Koira.

(*See* also Report No. 16.)

"Most of these were caught in or near villages. For shrews they are wonderfully nimble."—C.A.C.

(24) FELIS PARDUS, L.

The Panther.

(Synonymy in No. 5.)

1, Daltonganj.

(*See* also Reports Nos. 6, 9, 11, 13, 14, 16 and 18.)

(25) FELIS AFFINIS, Gray.

The Jungle Cat.

(Synonymy in No. 1.)

1, Singar, Gaya; ♂1, Koira; ♂1, Salbani; ♂1, Nimiaghat;
♂1, ♀1, Jagodih; ♂1, Lohra.

(*See* also Reports Nos. 3, 4, 5, 6, 7, 10, 11, 12, 15, 16 and 18.)

"Does not appear to be very common in Bihar and Orissa."—C.A.C.

(26) FELIS SP. (Domestic).

♀1, Nimiaghat.

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(27) VIVERRICULA MALACCENSIS, Gmel.

The Small Indian Civet.

(Synonymy in No. 3.)

♂1, ♀1, Jagodih.

(*See* also Reports Nos. 5, 7, 10, 11, 12, 13, 15, 16 and 18.)

(28) PARADOXURUS NIGER, Desm.

The Indian Toddy Cat.

(Synonymy in No. 6.)

♂1, Singar, Gaya; ♀1, Pareshnath; ♂1, Nimiaghat.

(*See* also Reports Nos. 7, 8, 11, 13, 15 and 18.)

(29) MUNGOS MUNGO, Gm.

The Common Bengal Mongoose.

(Synonymy in No. 1.)

♂2, ♀3, 3, Daltonganj; ♂1, ♀1, Jagodih; ♂1, Lohra; ♀1, Nimiaghat; ♂1, Gajhundi.

As I have pointed out elsewhere in this Journal (XXIV, p. 50) this is the first time we have received true *mungo*, as established by Gmelin. All other specimens which have been so labelled in these Reports have now (l.c.) been distributed to several local races.

"Very plentiful round Chainpur, I did not see many elsewhere."—C.A.C.

(30) MUNGOS SMITHI, Gray.

The Ruddy Mongoose.

(Synonymy in No. 7.)

♀1, Lohra.

(*See* also Reports Nos. 12, 13 and 18.)

"Several observed in the North of Hazaribagh, very shy."—C.A.C.

(31) MUNGOS AUROPUNCTATUS, Hodg.

The Small Indian Mongoose.

1836. *Mangusta auropunctata*, Hodgson, J., A. S. B., V., p. 235.
1837. *Herpestes nipalensis*, Gray, Charl. Mag. N. H., I., p. 578.

♀1, Nimiaghat; ♂1, ♀1, Midnapur.

There is a considerable difference between the two specimens from Midnapur and the one from Hazaribagh; the latter is undoubtedly true *auropunctatus*, but until more material is available I do not care to separate the Midnapur form.

"I was unlucky not to hit off the haunts of this Mongoose as it is no doubt locally quite common."—C.A.C.

(32) HYÆNA HYÆNA, Timm.

The Striped Hyæna.

(Synonymy in No. 1.)

♀1, Hazaribagh; ♂1, Jagodih.

(*See* also Reports Nos. 3, 4, 7 and 15.)

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"Common in Hazaribagh. Not seen or heard in the Santara Range, Singbhum. Mr. R. Kirkpatrick, D. F. O., of Chaibassa owns a tame hyæna which is exceedingly docile and lives quite happily with several small dogs. When shown to me it was at first shy, but soon became very friendly."—C.A.C.

(33) CANIS PALLIPES, Sykes.

The Indian Wolf.

(Synonymy in No. 3.)

♂ 2, ♀ 1, Hazaribagh (Collected by Maj. O. A. Smith).

(*See* also Report No. 10.)

"The wolves of Hazaribagh have become famous owing to their man-killing proclivities. Several packs terrorised the neighbourhood and became such a curse that rewards were offered by Government for their capture. Major Smith who has shot a number of these wolves added information on the subject. The wolves hunted by day in pairs or small packs, displaying a deadly courage and resource, and pulling down women and children and sometimes men. The members of a pack wander over a wide area, assembling after fairly regular intervals at certain spots."—C.A.C.

(34) CANIS INDICUS, Hodgs.

The Common Indian Jackal.

(Synonymy in No. 1.)

♂ 2, ♀ 1, Daltonganj; ♂ 3, Barkagaon; ♂ 1, Jagodih.
♀ 2, Lohra; 1, Gajhundi; 1, Singar, Gaya;
♂ 2, ♀ 1, Nimiaghat and 3 collected by Maj. O. A. Smith at Hazaribagh.

(*See* also all previous Reports except 2, 8, 13 and 17.)

I can find no difference of either skin or skull, among all these specimens, which cannot be accounted for by individual variation.

"Jackals are plentiful all over the cultivated areas. Not observed in Singbhum Forest. In Hazaribagh a second species or race is said to exist, having peculiar characteristics of colour and voice, and in habits somewhat resembling *Canis pallipes*. I am informed that in Hazaribagh jackals occasionally attack human beings."—C.A.C.

(35) VULPES BENGALENSIS, Shaw.

The Indian Fox.

(Synonymy in No. 1.)

♂ 2, 3, Daltonganj; ♂ 1, ♀ 1, Barkagaon; 1 collected by Major O. A. Smith, Hazaribagh.

(*See* also Reports Nos. 3, 5, 7, 10, 12 and 15.)

The type locality is given by Shaw as 'Bengal,' these therefore are practically topotypes.

"Very common near Daltonganj and in the South of Hazaribagh. Not observed in Singbhum."—C.A.C.

(36) MELLIVORA INDICA.

The Indian Ratel.

(Synonymy in No. 3.)

1, Gajhundi.

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(37) MELURSUS URSINUS, Shaw.

The Sloth Bear.

(Synonymy in No. 11.)

1, Nimiaghat.

(*See* also Report No. 13.)

(38) PETAURISTA ORAL, Tick.

The Central Indian Flying Squirrel.

(Synonymy in No. 2.)

♂1, ♀3, Luia.

In the Berars Report three specimens of a *Petaurista* were provisionally recorded as *oral*, pending the receipt of topotypes for comparison. The type locality of *oral* is Chaibassa, so that we may accept these specimens as topotypes. On careful comparison with the Berars specimen I can find no difference.

"Flying Squirrels occur sparingly in the heavy jungles of the Santara Range, Singbhum.

P. oral is normally nocturnal and spends the day in hollow trees, but during the rains I find it will move about and feed during the day. I think the explanation of this is that it takes advantage of dry intervals whenever they occur. At this season it changes its regular haunts and sleeps in the forks of trees, or among foliage. Its coat harmonises to such a remarkable degree with its surroundings as to make it hard to see. It sleeps coiled up with the head hidden, and the tail encircling the body, and the parachute is partly extended."—C.A.C.

(39) RATUFA INDICA CENTRALIS, Ryl.

The Central Indian Giant Squirrel.

(Synonymy in No. 11.)

♂2, ♀1, Sangajata; ♂6, ♀4, Luia.

These specimens agree quite closely with Miss Ryley's type from Hoshangabad.

"This handsome squirrel is gregarious, and one of the most locally distributed animals, I have ever come across. At Luia it inhabits a piece of jungle perhaps a mile square, and outside this it is useless to search for it. Near Sangajata the favourite haunts were patches of jungle near the river, and though I passed through much of the Forest here, nowhere else, outside the spots mentioned, did I see the large conspicuous nests made by this species. The call is a loud rattle used principally, I think, when alarmed. This squirrel lives among the most lofty trees, it can take huge leaps, and is equally at home on a smooth trunk or scrambling among the slenderest twigs. I have never seen it lower than about 12 feet from the ground. The Kols say it breeds during the hot weather."—C.A.C.

(40) FUNAMBULUS PALMARUM, L.

The Palm Squirrel.

(Synonymy in No. 2.)

♀1, Pareshnath; ♂1, Singar, Gaya; ♂1, ♀3, 1, Jagodih; ♂2, ♀1, Lohra; ♂1, ♀3, Gajhundi

(*See* also Reports Nos. 4, 5, 7, 8 and 9.)

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"Blanford states this squirrel is not found in forests, but in my experience though partial to the neighbourhood of cultivation, it may like *pennanti* be found far into the forests."—C.A.C.

(41) FUNAMBULUS PENNANTI, Wrought.

The Common Five-striped Squirrel.

(Synonymy in No. 1.)

♂ 3, Singar, Gaya; ♂ 3, ♀ 1, Nimiaghat; ♀ 1, Luia; ♀ 2, Salbani; ♂ 4, ♀ 4, 6, Daltonganj; ♂ 1, Barkagaon; ♂ 1, ♀ 4, Jagodih; ⚥ 2, ♀ 1, Lohra.

(*See* also Reports Nos. 2, 3, 4, 5, 7, 10, 12 and 15.)

We have now the approximate line of demarcation between these two species (*pennanti* North and *palmarum* South). Commencing from Surat through Nimar, Berar to Hazaribagh, *i.e.*, from about 28° N. on the West Coast to 24° N. on the Ganges.

"Common at Chainpur and well distributed throughout Hazaribagh where however it overlaps with *F. palmarum*, the latter I think predominating. At several places I shot both these squirrels on the same ground but did not find them together in any one tree."—C.A.C.

(42) TATERA INDICA, Hardw.

The Indian Gerbil.

(Synonymy in No. 1.)

♀ 3, 2, Daltonganj; ♂ 1, Gajhundi; ♂ 2, ♀ 1, Salbani.

(*See* also Reports Nos. 2, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 15.)

"Generally rather rare in Bihar and Orissa."—C.A.C.

(43) VANDELEURIA OLERACEA, Benn.

The Dekhan Tree Mouse.

(Synonymy in No. 2.)

♂ 1, Lohra.

(*See* also Reports Nos. 4, 5, 7 and 10.)

(44) VANDELEURIA OLERACEA MARICA, Thos.

The Bengal Tree Mouse.

1915. *Vandeleuria oleracea marica*, Thomas. Journ., B. N. H. S., XXIV., p. 54 ♂ 1, Luia; ♀ 5, Koira.

Practically nothing but colour separates this form from true *oleracea*.

(45) MUS MANEI, Kel.

The Common Indian House Mouse.

(Synonymy in No. 5.)

♂ 3, ♀ 6, Daltonganj; ♂ 3, ♀ 6, Gajhundi; ♂ 2, ♀ 1, Singar, Gaya; ♂ 2, ♀ 4, Nimiaghat; ♂ 1, Pareshnath; ♂ 4, ♀ 5, Luia; ♀ 3, Salbani.

(*See* also Reports Nos. 6, 8, 9, 10, 11, 12, 13, 14, 16 and 18.)

"Common in all villages."—C.A.C.

(46) MUS BOODUGA, Gray.

The Southern Field Mouse.

(Synonymy in No. 1.)

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♂1, ♀1, Daltonganj; ♂3, ♀1, Barkargaon; ♀2, Jagodih; ♂1, Lohra; ♀ 1, Gajhundi; ♂ 6, ♀ 2, Nimiaghat; ♀ 1, Pareshnath; ♂13, ♀18, Luia; ♂2, ♀2, in al. 6, Koira; ♂1, ♀5, Salbani.

(*See* also Reports Nos. 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16 and 18.)

"Everywhere common about cultivation and are frequently met with in forests."—C.A.C.

(47) LEGGADILLA GURKHA, Thos.

The Kumaon Spiny Mouse.

(Synonymy in No. 15.)

♀1, Singar, Gaya; ♂4, ♀3, Pareshnath.

"Very rare; more abundant in Pareshnath, where all my specimens were taken from quite a small area, which was stony and less covered with vegetation than its surroundings."—C.A.C.

(48) EPIMYS BLANFORDI, Thos.

The White-tailed Rat.

(Synonymy in No. 2.)

♂4, Jagodih; ♂3, ♀1, Lohra; ♀2, Gajhundi; ♂5, ♀12, Pareshnath.

(*See* also Reports Nos. 6, 7, 9 and 11.)

"Rarely found any distance from hills, where it lives among the rocks, probably scooping out a small hollow for a nest. I have only very occasionally observed any distinct burrows."—C. A. C.

(49) GUNOMYS BENGALENSIS, Gr. and Hardw.

The Bengal Mole-Rat.

1833. *Arvicola bengalensis*, Gray & Hardwicke, III, Ind. Zool., II, pl. 21.
1854. *Mus daccaensis*, Tytler, A. M. N. H., XIV., p. 173.
1878. *Mus (Nesokia) blythianus*, Anderson, J. A. S. B., XLVII, p. 227.
1878. *Mus (Nesokia) barclayanus*, Anderson, l. c., p. 229.
1891. *Nesocia bengalensis*, Blanford, Mammalia No. 295.

♂6, ♀13, Daltonganj; ♂1, Singar, Gaya; ♂23, ♀18, Nimiaghat; ♂1, Sangajata; ♂6, ♀3, Luia; ♂6, ♀10, Salbani.

"A common rat in Bihar and Orissa."—C.A.C.

(50) BANDICOTA ELLIOTANA, And.

The Bengal Bandicoot.

1878. *Mus (Nesokia) elliotanus*, Anderson, J. A. S. B., XLVI, p. 231.
1891. *Nesocia bandicota*, Blanford, Mammalia, No. 296 (partim).

♀ 2, Gajhundi; ♂ 1, Barhi (Collected by Maj. O. A. Smith).

A smaller bandicoot than either *gigantea* or *malabarica*, about the size of *nemorivaga*, like which it lacks the mantle of long hairs found in the larger species. It is however black while *nemorivaga* is brown.

(51) MILLARDIA MELTADA, Gray.

The Soft-furred Field-Rat.

(Synonymy in No. 1.)

♀1 Pareshnath.

(*See* also Reports Nos. 3, 4, 5, 7, 10, 11 and 13.)

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(52) CREMNOMYS CUTCHICUS, Wrought.

The Cutch Rock-Rat.

(Synonymy in No. 3.)

♂3, ♀1, Gajhundi; ♂2, ♀2, Singar, Gaya.

(*See* also Reports Nos. 8, 9, 10 and 12.)

(53) GOLUNDA ELLIOTI, Gr.

The Indian Bush-Rat.

(Synonymy in No. 1.)

♂1, Pareshnath.

(*See* also Reports Nos. 2, 3, 4, 5, 6, 7, 10, 11 and 15.)

"Taken on a steep rocky slope, an unusual environment, as *G. ellioti* is not a climber. It must be very rare on this side of India because at each camp many traps were set and I should have taken this rat if occurring in any numbers."—C.A.C.

(54) LEPUS RUFICAUDATUS, Geoff.

The Bengal Hare.

(Synonymy in No. 15.)

♂8, ♀4, Daltonganj; ♂2, ♀3, Singar, Gaya; ♂1, Midnapur; ♀1, Salbani.

These do not differ markedly on the average from the Kumaon specimens and may, I think, be now confidently accepted as true *ruficaudatus*.

"Except at Daltonganj and Singar, nowhere very common. Not observed in the Santara Range, Singbhum. Rare near Midnapur and Salbani."—C.A.C.

(55) GAZELLA BENNETTI, Sykes.

The Indian Gazelle.

(Synonymy in No. 1.)

♂1, ♀1, Jagodih; ♂1, ♀2, Hazaribagh; (Collected by Maj. O. A. Smith).

(*See* also Reports Nos. 3, 7 and 10.)

(56) MANIS CRASSICAUDATA, Geoff.

The Indian Pangolin.

(Synonymy in No. 3.)

♀1, Chaibassa.

(*See* also Reports Nos. 6, 8, 9, 11, 13 and 18.)

"The specimen obtained at Chaibassa was presented to me alive. When alarmed, the animal rolls itself into a ball with the head inside and the extremely muscular tail wrapped round the body, this means of protection is so efficient that a strong man can with difficulty unroll the animal. This Pangolin, when placed on a camp table, crawled over the edge, lowered itself by keeping the terminal part of the tail flat on the table; a clumsy hold on the framework was then obtained with the fore feet, until the tail was brought down to grip the table leg and the pangolin lowered itself to the ground. As the fore toes are doubled up under the feet when walking, I imagine that the ascent of steep places is performed backwards, the prehensile tail being used to haul the pangolin up banks or rocks."—C.A.C.

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"SOME NEW CEYLON *COCCIDÆ*."

BY

A. RUTHERFORD, M.A., B.SC.,*

Govt. Ent. of Ceylon.

Ripersia theæ, sp. nov.

Adult female, oval-cylindrical, about 2 mm. long, enclosed in a loose white test.

Derm thickly studded with small, circular gland-pores. Antenna of seven segments, the seventh segment much the longest and ending in a long seta; basal segment broader than long; segments 3, 4, 5 and 6 shortest and of much the same length; setæ on all segments. Legs well developed, very stout. Coxa stout, and twice as broad as long; femur stout usually not more than twice as long as broad; tibia but slightly longer than the tarsus and both stout; tarsal claw broad at base, sharply incurved at the apex; digitules present, tarsal simple, ungual apparently dilated at apex.

Anal ring with six long setæ; the setæ rise from a hyaline band bordered on each side by a row of gland-pores. Anal lobes indistinct; position indicated by a long seta; near the base of this seta a group of small, scattered, circular pores, two stout conical spines and several more slender spines. Similar groups of pores and spines (2 or 3 in a group) occur on the lateral margins of the segments in front of the anal segment. Stout conical spines and a few long slender spines and numerous small pores occur all over the body.

On branches of tea at Peradeniya, June 1913 and July 1914. All the insects in one colony were irregularly ruptured at one end and resembled somewhat small dipterous puparia from which the adult fly had escaped. A colony of what was probably the same species of insect, observed in June 1913, had been apparently completely exterminated by the caterpillars of *Spalgis epius*, a large number of the pupæ of this Lycænid, occurring on the bush.

This insect in the seven-segmented antennæ and in the general character of the legs resembles *Dactylopius theæcola*, Gr., described from roots of tea plants from India. It shows many points of difference however.

Coccus litzeæ, sp. nov.

Female insect flattish, dark-brown and covered with granular paletus of yellowish-white wax. There is a medium dorsal and two submarginal ridges; the medium ridge is connected with the submarginal ridges by two transverse ridges and numerous ridges run from the submarginal ridges to the margin. The shape is roughly circular, the anterior end sometimes being slightly acuminate. Length about 3 mm. It resembles somewhat *L. piperis*, Gr., but is much darker in colour and eyes are not visible.

Male scale occurring along with female, scarce; composed of 18 plates. In slide preparations the positions of the ridges stand out as translucent areas; the mid-dorsal clear area does not reach to the anal plates. Oval translucent areas occur in groups, especially on the marginal and submarginal areas and cephalad of the anal plates. There is a particularly prominent group towards the inner margin of each of the chitinised areas lying between the clear areas corresponding to the ridges; it lies just lateral of the position of the submarginal ridge.

*We regret to announce that Mr. Rutherford has died since writing this paper—Eds.

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Body covered with small pores (? wax-tubes).

Eyes are prominent and lie just lateral of the base of the antennæ. Antennæ with six segments, the third very long and sometimes showing traces of subdivision; legs slender; tibia plus tarsus long, longer than femur, tarsus as long as tibia. Claw sharp, tarsal and ungual hairs present. Femur comparatively stout, relatively broader than in Green's figure of *L. piperis*, Gr. Anal plates as in *L. piperis*, but broader in comparison with their length. They are broadest in their caudal half.

Stigmatic spines thin, one longest, taper slowly to apex and are sometimes slightly constricted at the base; they are set in a deep notch expanded inwardly as in *L. piperis*, Gr. Marginal setæ simple, rather longer and stouter than in *L. piperis*, Gr.

Anal ring with eight setæ. Margin of space containing anal plates with a row of gland-like structures.

Body of parent contains young with well-developed mouth-setæ.

Larvæ purplish.

On stem and branches of *Litsea longifolia*, Peradeniya, 22nd August 1914.

This insect falls near *L. piperis*, Gr., from which however it has many points of difference.

Neolecanium pseudoleæ, n. sp.

Adult black or dark-brown, about 2·50 mm. long, longer than broad, acuminate, but usually not symmetrically so, towards the anterior end. Dorsum tubercled and with a thin coating of white wax; insect rather flat.

The insect resists prolonged boiling in 10 per cent. KoH so that few structures can be made out. The margin of the body and of the anal cleft is more heavily chitinised than the rest of the body. The derm is thickly studded with irregularly-shaped, translucent areas. The anal plates are longer than broad, the lateral margin a continuous curve. Marginal setæ are long, simple and stout and are set at fairly wide intervals; there are also shorter setæ. Stigmatic spines are set on margin, two or three, one larger than the others; sometimes of three lengths. Parastigmatic pores mesal of the stigmatic spines.

Larvæ with a distinct caudal notch, its lateral sides each with a comparatively large, crescentic, fairly conspicuous plate. Anus at base of plate. Two anal setæ to be made out. A long setæ at the apex of each plate and a long, stout, backwardly directed seta on the margin opposite each stigma.

What is probably another but younger form of the same insect occurs on the same tree. It is of the same shape. The dorsum sometimes possesses a median, longitudinal ridge with transverse ridges running out from this; the dorsum is covered with a thin, white bloom that is often however absent from the median region. Some are tabular.

The derm possesses numerous, conspicuous, circular or oval clear areas. There is a submarginal band of more or less circular plates of chitin each showing concentric layers. The marginal setæ are long, stout and simple. Stigmatic spines two or three, one longer than the others; the two shortest tapering and sharp at apex; parastigmatic pores as above.

Anal plates as above. Antennal segments rather indistinct, but seven or eight, probably eight segments, the fourth being very short; legs well developed; tibia but slightly longer than tarsus; tarsus showing traces of two lines of subdivision. Claw hooked at apex, sharp, broad at base. Length of mounted insect about 3 mm.

On branches of Cinnamon, Peradeniya, Ceylon, July 1914. This insect in microscopical characters resembles *S. obae* more than it does any insect with which the writer is acquainted. The appearance of the fresh insect, however, is quite different.

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Aspidiotus (*s. str.*) *panici*, n. sp.

Scale of female pinkish-grey and slightly elongated, narrower at one end than at the other; exuviae golden-yellow, situated towards the broader end and partly covered by secretion. Ventral scale complete.

Adult female slightly longer than broad. Pygidium large, abdominal segments contracted drawing in the pygidium. Body hyaline except the pygidium which is somewhat chitinised especially at the apex.

Antenna consists of a tubercle, notched at apex and bearing a long curved seta near its base. No parastigmatic pores.

Three pairs of lobes. Median lobes largest each with a stout basal piece projecting well into the pygidium; placed close together the mesal sides diverging slightly towards the apex; apex rounded with a slight angle on the mesal side; lateral side with one or two conspicuous notches.

Second lobes with sides parallel towards the base, convergent towards apex with a lateral notch. Third lobes small, broader than long, sides of equal length, apex truncate and sometimes with a small apical point. Pygidium laterad of the third lobes coarsely lobate.

Pectina between median lobes, 1 or 2 between median and second lobes, 3 between second and third; all shortly pronged at the apex. A long, stout, straight seta laterad of the median lobes and projecting well beyond the lobes; shorter setæ laterad of second and third lobes and on the pygidia margin. Dorsal pores small. Anus considerably caudad of vagina, long and narrow.

Circumgenital pores (7 and 7) (5 and 6); body contains young with mouth-setæ well developed.

Under the leaf-sheaths of *Panicum incinatum*, Peradeniya, Ceylon, July 1914.

Parlatoria zeylanica, n. sp.

Adult insect slightly longer than broad and broadly rounded at the anterior end. Abdominal segments distinct. Pygidium slightly chitinised, its base showing a faint tessellation. Antenna consists of a small tubercle bearing a long seta. Between antennæ and cephalad of mouth-parts are some 5 or 6 tubercles, each bearing a seta at the apex. Pygidium with three pairs of lobes. Median lobes with sides parallel to near apex, then notched, the apex low and rounded; the lateral margin may have two notches. Second lobes similar but shorter. Third lobes broadly triangular and serrated at the apex.

Pectinæ 2 (between median lobes) 2, 3, and cephalad of the third lobe, three more. One of the fimbriations of the pectinæ is usually much longer than the rest. A long seta laterad of median lobes, and shorter ones on and laterad of each of the second and third lobes. Broad, parlatoria-like gland-pores, one between the first and second, and between the second and third lobes, and two laterad of the third lobes; each set in a deep notch and with edges strongly chitinised. No circumgenital pores.

Anus on a level with a line joining the anterior lateral extremities of the pygidium. Few dorsal pores; about eight or nine scattered over the pygidium, large. A few similar gland-pores on the lateral margins of the abdominal and thoracic segments and four on the middle region of the segment in front of the pygidium, two on each side.

Internal part of gland-tube very short, broader than long.

Associated with *Chionaspis simplex*, Gr., and *Aspidiotus secretus*, Gr., on a "small bamboo," Peradeniya, August 1914.

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Parlatoria cinnamomi, n. sp.

Female scale golden-yellow; a black area just caudad of the first exuvium; some with a black area in the middle of the first exuvium; both exuviæ covered with a thin, white wax.

A male scale associated with the above insects had a black spot on the exuvium.

Adult female broader than long, pygidium somewhat retracted. Three pairs of lobes placed far apart. Median lobes have a deep notch on each side near the apex, which is narrow; sometimes there are two notches on the lateral side. Second lobe similar but may have several notches on the lateral margin; the apex too is more sharply pointed. Third lobe scarcely notched on the mesal side, with several notches on the lateral side and the apex pointed. Pectinæ broad, expanded distally; 2 between median lobe, 2 between median and second lobes and 3 between second and third lobes. Laterad of third lobe in order—a pectina, two-rounded projections, a long hyaline lobe with a seta laterad of it, and a series of lobe-like processes rounded at apex and extending on to the abdominal segment in front of the pygidium. A small triangular gland-pore projection midway between median lobes, between median and second lobes and laterad of the second pectina, between second and third lobes; several less distinct cephalad of 3rd lobes. Internal part of gland-tube very short. A seta at the base of each lobe on its lateral side, and one on the pygidial margin. Circumgenital pores anterior (6 and 7), posterior (4 and 3). A few anterior parastigmatic pores. Pygidium of second exuvium very similar to that of adult. There are several pectinæ laterad of the third lobes and the abdominal segments are without the rounded projections of the adult.

On upper surface of leaves of Cinnamon, Peradeniya, Ceylon.

I have observed the same insect on leaves of *Caryota urens* at Peradeniya. It falls near *P. aonidiformis*, Gr., but differs in the much broader pectinæ and in the character of the processes on the margin of the pygidium as well as in the prominent, gland-pore projections.

Parlatoria zeylanica, sp. nov.

Female scale light-brown, composed entirely of the exuviæ. Second exuvium three times the length of the first, both covered with a whitish secretion. A pitchy black area just caudad of the first exuvium. Three pairs of lobes, median lobes longer than broad, triangular towards apex, irregularly indented. Second lobes often longer than broad or at least as long as broad, the lateral side slightly indented. Third lobe not always distinguishable from the lobe-like plates; when visible longer than broad with apex rounded. Two plates between the median lobes, two between median and second and two or more between the second and third. The plates extend well beyond the lobes, are often slightly expanded towards the apex, are roundly truncate at apex with a fine median projection, the whole resembling a partly burnt candle. Laterad of third lobes are about four or five short, usually stout, blunt, lobe-like plates. Marginal pores not visible. Circumgenital pores (6 and 7) (4 and 3). Anus slightly caudad of the caudo-lateral group of circumgenital pores. Anterior spiracles apparently without parastigmatic pores.

The pygidium of the second exuvium has three pairs of conspicuous lobes. The median lobes have faint mesal and lateral notches. The second and third lobes have each a laterad notch or the third may be without such a notch. There are two pectinæ between the median lobes, two between the median and second, three between the second and third, and a series of seven or eight laterad of the third lobes; the pectinæ are broad and

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do not project beyond the lobes. There is a broad gland-pore between the median and second, and the second and third lobes, and two on the pygidium cephalad of the third lobes; the duct is short and broad, almost as broad as the incision.

On the under surface of leaves of Cinnamon, Peradeniya. This insect has a distinct resemblance to *P. atalantiæ*, Gr. The colouration of the scale however is different, the lobes are longer and the plates stouter. Lobes and plates are grouped more closely than in Green's figure of *P. atalantiæ*, and I have never seen the third lobe as there represented.

A very similar insect occurs on the leaves of *Vitis* sp. *Sterculia thwaitesii* and *Polyalthia* sp.

In insects from *Vitis* the lobes are more prominently notched and there are 3 or 4 plates between the second and third lobes. The lobes of the second exuvium are all notched on the mesal and lateral sides, the mesal notch usually being situated caudad of the lateral; a short band of yellow chitin, probably representing a fold, runs meso-cephalad on each side from the base of the pygidium which is somewhat retracted. The larva has two pairs of distinct lobes. The insects are attached by chalcids.

In insects from *Sterculia* the plates are not quite so long as in Cinnamon, and their shape is not constant, varying on the two sides of the one pygidium. There are sometimes four plates between the second and third lobes, one or more of them apparently devoid of the apical prolongation.

Insects from *Polyalthia* show three pectinæ between the second and third lobes.

If these insects are identical with *P. atalantiæ*, Gr., this insect is much more variable than Green has represented it.

Parlatoria, sp.

Female scale circular, Aspidiotus-like; exuviæ greenish yellow, the second less than twice the length of the first; axes of exuviæ not in a straight line often inclined to each other at a high angle; first exuvium with a distinct median ridge: secretion greyish-white.

Head and thoracic segments occupy the major part of the body; abdominal segments contracted pulling the pygidium somewhat into the body; anterior end broadly rounded; pygidium very slightly chitinised. Five pairs of lobes. Median lobes longer than broad, widening distally, each side with a prominent notch near the apex, apex rounded. Second lobes longer than broad, rounded at apex, distinctly notched on the lateral side, indistinctly so on the mesal side. Third lobe similar to second but smaller. Fourth lobe triangular, longer than broad, sharply pointed and serrated on the lateral side. Fifth lobe similar to fourth but smaller. Pectinæ two between median lobes, two between median and second lobes, three between second and third lobes, three between third and fourth, four between fourth and fifth and two laterad of fifth.

Segments in front of pygidium with stout, triangular, plate-like projections. Marginal pore between median lobes, one between median and second, one between second and third, two between third and fourth, the mesal being the smaller, three between fourth and fifth; all pores with broad chitinous rim. Internal gland tube more than twice as long as broad and of about the same width throughout. Five or six rows each of three or four dorsal pores extending a short distance cephalad of the margin of the pygidium on each side of the middle line. Anus longer than broad, caudad of a line joining the fifth lobes. Vagina near the base of the pygidium. A seta laterad of each lobe. A single circumgenital pore in the position of the cephalo-lateral group of one side. Body contains larvæ with well-developed mouth-setæ and two pairs of lobes. Anterior

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spiracles with six parastigmatic pores in a row and widely separated, situated meso-cephalad of the opening. Antenna a rounded tubercle bearing a long curved seta.

On upper surface of leaves of *Diospyros ebenum*, Peradeniya, Ceylon, 27th August 1913. *Parlatoria pergandii*, var. *phyllanthi*, Gr., occurs on the same leaves along the side of the midrib. This insect falls near *P. pergandii*, Comst., but is distinguished by the much greater length of the gland-tubes as well as by the virtual absence of circumgenital pores. It is very near *P. mangiferæ*, Morlatt; the fourth and fifth lobes are longer and narrower, the interval between the median lobes slightly greater, being wider than the breadth of the lobe. The number and arrangement of the parastigmatic pores too is somewhat different (those of *P. mangiferæ* being from 8 to 10 in number and situated in a *group* on the inner side of the stigma).

Lepidosaphes vandæ, n. sp.

Female scale very dark-brown in colour, except the first exuvium which is paler. First exuvium with a mid-dorsal, longitudinal, rounded ridge. Second exuvium of same colour as the first but covered with secretion. Secretion transversely and coarsely ridged. Length of scale difficult to determine as they are usually curved and massed together under the leaf sheaths; about 2·50—2·75 m.m.

Male scale paler with a flat, white margin to the secretion. The exuvium usually provided with a covering of white wax which projects in front like two horns. Hinge narrow, whitish.

Adult female more than twice as long as broad, broadest in thoracic region, anterior end rounded and provided with small conical processes. Posterior abdominal segments not markedly produced laterally. Attenna an irregularly-shaped tubercle bearing 3 setæ. Anterior spiracles with a group of 11-14 pores; posterior without pores.

Two pairs of lobes. Median lobes broader than long, set rather close together, somewhat triangular, sides of triangle serrate, the extreme apex a small, rounded lobe; sometimes the apex is nearer to the mesal than to the lateral side, giving the lobe a resemblance to that of *Howardia biclavis*. Second lobe duplex; mesal half large, mesal side short, lateral side long, oblique and serrated; lateral half a minute tooth.

Laterad of second lobes the margin of the pygidium is serrated, especially in the region of the second part of pore openings.

Marginal pores prominent, oval, twice as long as broad.

Dorsal pores few, small and somewhat inconspicuous.

Four comparatively large, circular, translucent areas (dorsal pores) just cephalo-laterad of the second lobe.

Plates 2, 2, 1, 2, 2; plates between median lobes and between median and second lobes short and comparatively inconspicuous; that laterad of second lobes large.

Plates on lateral margin of abdominal segments long-dome-shaped with a more slender median projection.

Two setæ between median lobes, one laterad of median lobes, one between halves of second lobes, and one laterad of each pair of pore-projections.

Circumgenital pores 6 (13 and 15) (8 and 9); 6 (12 and 9) (7 and 7); 5 (14 and 9) (9 and 13); 7 (12 and 12) (8 and 11). The median pores may or may not be arranged in a transverse row.

The anus is situated cephalad of the median group.

The pygidium of the second exuvium is very similar to that of the adult. There is but 1 plate in each of the fourth and fifth places. There are no such points on the lateral margin of the abdominal segments as Green records for *L. beckii*.

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On stems of *Vanda spathulata*, Peradeniya, Ceylon, September 1914.

This insect falls very near *L. beckii*, but has several points of difference which are indicated in the course of the description.

Leucaspis limoniæ, sp. nov.

Female scale elongate, narrow, dark-brown, consisting chiefly of the large second exuvium. There is occasionally to be seen a small mass of white wax cephalad of the first exuvium, and a narrow fringe at the posterior end. The dorsum of the second exuvium is sometimes lightly dusted with white wax. There is a transverse line of weakness in the first exuvium at a point about two-fifths of its length from the anterior end.

Male scale with exuvium dark-brown and a white secretion of much the same dimensions as the second exuvium in the female scale.

Adult female several times longer than broad, greenish, abdominal segments not laterally produced.

Antenna a comparatively large tubercle sometimes tapering towards apex and bearing three long straight hairs, the mesal and lateral ones of each group of equal length and longer than the middle one; situated cephalad of the mouth parts and about four times their width apart.

Anterior spericles with about eight parastigmatic pores in a double row running cephalad from the spiracle; posterior spiracles without such pores. A few sharp, triangular processes situated round the cephalic margin. Mouth setæ long. Pygidium hyaline. Four conical lobes, tapering from base, much longer than broad pointed at apex; median lobes slightly larger than the second. A pair of long, narrow apically expanded pectinæ between the median lobes, a similar part between first and second lobes and two or three laterad of the second lobes. Thereafter two short, broad, pectinæ followed by a series of about eight truncate plates, longer than broad, each traversed by a gland duct. There is a longitudinal row of broad, cone-shaped processes running along body laterad of the mouth parts (these are probably marginal, their apparent position being due to a longitudinal folding of the body). Dorsal pores small and scattered. Anus near base of pygidium. Circumgenital pores in an arch, the caudo-lateral group being separated from the rest; there are from twenty-six to thirty-three in the median group and nine to thirteen in the caudo-lateral. Latero-cephalad of the main groups on each side are two groups of four (or two) each.

Second exuvium with two pairs of prominent lobes projecting far into the pygidium, with broad pectinæ and gland-pores between them. Along the sides of the body are situated numerous, broad, cone-shaped processes deeply concave at the apex and one or two more elongate, pectinæ-like processes.

First exuvium with a single pair of lobes; mesal of each a seta and a gland-pore and between the two gland-pores two short precesses irregularly serrate at apex.

On leaves and petioles of *Limonia alata*, Peradeniya, Ceylon, August 1914.

This insect resembles *Leucaspis cockerelli*, (de Charm) but the lobes are of a different shape and are not notched, while the pectinæ are longer (extending well beyond the lobes) and the median and cephalo-lateral groups of circumgenital pores form a continuous series.

Aulacaspis uncinati, n. sp.

Scale of female not much longer than broad; secretion white; exuviæ reddish-brown, situated at one side.

Extreme apex of pygidium somewhat truncate. Three pairs of lobes. Median lobes hyaline, not united at the base, expanded caudally and slightly divergent towards the apex; margins slightly indented; a slight

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band of chitin along their mesal sides. Second lobes distinct, duplex; mesal part expanded towards the apex and further projecting slightly farther caudad than the lateral part which is wider at the base than towards the apex. The third lobes are distinctly present on one side; duplex, mesal half large and conspicuous, lateral half shorter distal margin of both parts oblique. A prominent gland-pore projection laterad of the median lobes and a still more prominent one laterad of the second lobes and two pairs on the pygidial margin cephalad of the third lobes.

Plates 1, 1, 1, 1, 5-6. A dorsal seta laterad of the median lobes, one between the parts of the second and third lobes and one laterad of each pair of pore-projections.

Dorsal pores few, large, in three rows on each side of the pygidium, the inner row consisting of three and situated just laterad of the circumgenital pores.

Circumgenital pore 11 (24 and 25) (18 and 19); the median in a compact group, the cephalo-laterals in three or four longitudinal rows, the caudo-laterals in two or three rows.

Anus at level of interval between cephalo-and caudo-lateral groups of pores.

Antenna consists of a rounded tubercle bearing a single seta; antennæ situated as in *A fagreæ*, Gr. A group of anterior parastigmatic pores apparently present.

Underneath leaf-sheaths of *Penicum uncinatum*, Peradeniya, July 1914.

This insect resembles somewhat *A fagreæ*, Gr., but differs in the character of the median lobes, in the presence of a third lobe and in the number of circumgenital pores; (of *A fagreæ*, Gr.), Green says, "the lower groups in every case containing the greater number."

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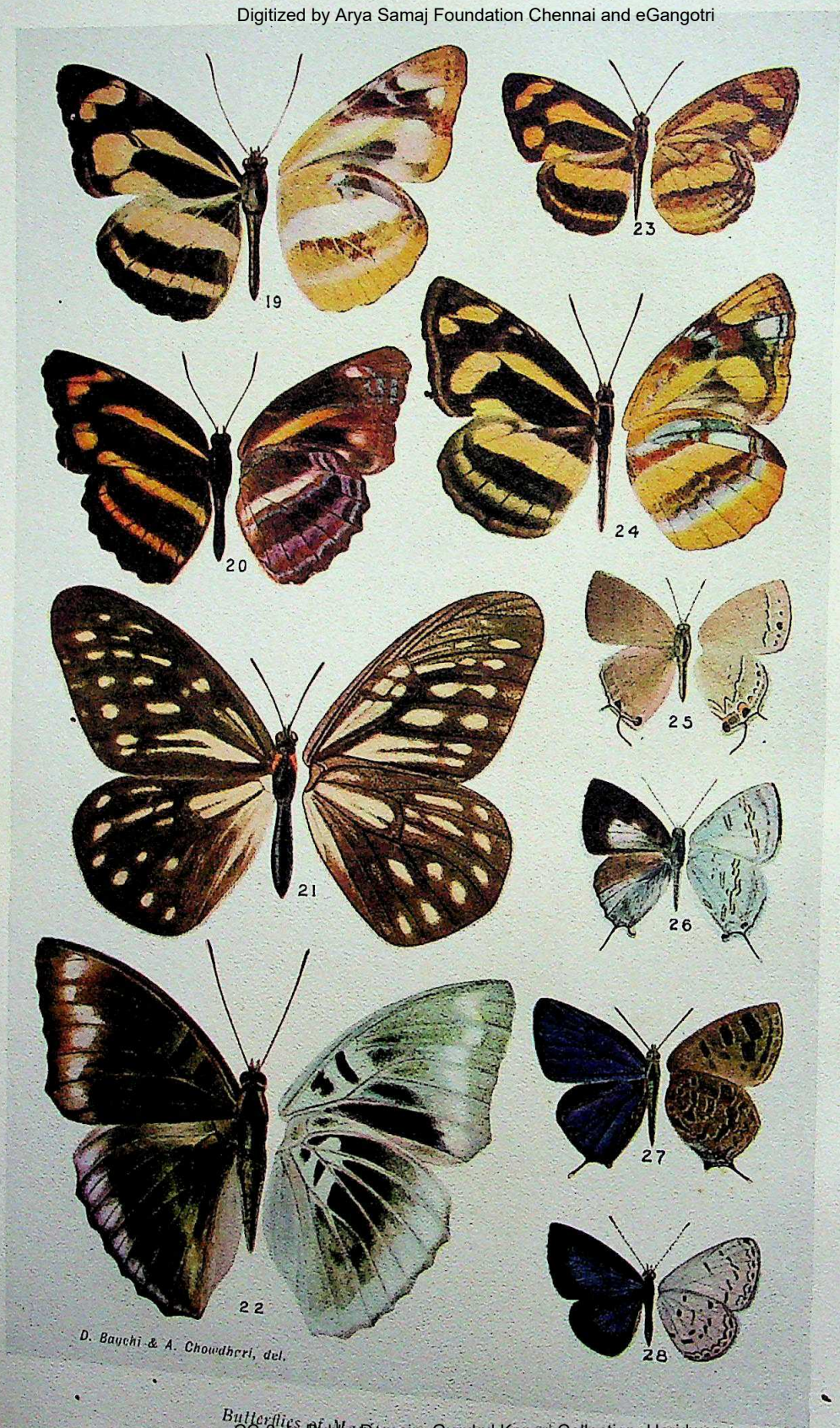

Butterflies of Manipur and the Naga Hills.

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NOTES ON SOME NEW AND INTERESTING BUTTERFLIES FROM MANIPUR AND THE NAGA HILLS.

EXPLANATION OF PLATE III.

Fig. 19.—Neptis kirbariensis, n. sp. ♀.

" 20.—Neptis namba, n. sp. ♂.

" 21.—Calinaga aborica, n. sp. ♂.

" 22.—Euthalia japrea, n. sp. ♂.

" 23.—Rahinda pasna, n. sp. ♂.

" 24.—Neptis nemorum phesimensis, n. sp. ♂.

" 25.—Theela saitua, n. sp. ♂.

" 26.—Pseudochliaria virgoides, n. sp. ♂.

" 27.—Arhopala arata, n. sp. ♂.

" 28.—Cyaniris melpomoides, n. sp. ♂.

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NOTES ON SOME NEW AND INTERESTING BUTTERFLIES FROM MANIPUR AND THE NAGA HILLS.

BY

LIEUT.-COL. H. C. TYTLER, 17TH INFANTRY.

PART III.

(*With plates III & IV.*)

Family—LYCÆNIDÆ.

Sub-family—*Gerydinæ.*

GERYDUS BOISDUVALI, Moore.

A male and female taken at Nichuguard in October and November and several males at Sebong, Manipur, in November, January and February.

GERYDUS LONGEANA, De N.

Occurs commonly in the Manipur Valley itself. Many specimens were also taken at Sebong and on the Cachar Road, Western Manipur Hills; also taken at Nichuguard, Naga Hills.

There are three well defined forms of this species.

(1) The *wet-season-form*, the males of which cannot be distinguished from *G. boisduvali* taken in the *dry-season*, the females can however be easily separated by the broad continuous white discal band on forewing. Taken from May to November.

(2) An *intermediate dry-season-form*, agreeing with Bingham's description, which flies from October to May.

(3) An *extreme dry-season-form* which varies from very pale brown with dashes of white to almost pure white; taken from November to March.

Some specimens of the wet-season-form agree with the description of *Gerydus irroratus*, var. *assamensis*, Doherty.

ALLOTINUS DRUMILA, Moore.

Decidedly rare in Manipur; a pair taken on the Irang River, Western Manipur Hills, in February. Up till 1913, I had only managed to obtain one female in the Naga Hills, but in 1914 during March, April and May my collectors managed to obtain a male and twenty-one females at Nichuguard. The males appear to be very rare.

ALLOTINUS SUBVIOLACEUS, Moore.

A female taken on the Cachar Road, Western Manipur Hills, in November and a male and three females in December.

This is an interesting capture as it has not been previously recorded further North than S. Burma.

De Nicèville calls the Burmese form *A. alkamah*, distinguishing the same from the Javan form, true *subviolaceus*, in having the violaceous area on upperside in the male of greater extent.

The conspicuousness of the violaceous area on both wings of the three females now before me is variable; one female has it dull like the male, whilst the other two have it bright and clear.

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ALLOTINUS HORSFIELDII, Moore.

Very common on the Burma and Cachar Roads in Manipur.

LOGANIA MASSALIA, Doherty.

Two males taken at Nichuguard, Naga Hills, in May and June and a female at the same place in October. Five males also taken at Sebong, Manipur, in November and January.

One male from Nichuguard differs in having the white discal spot produced inwardly to the base of the wing.

The size varies a good deal, my largest male measuring 1·1″ and my smallest 0·8″.

LOGANIA SUBFASCIATA, n. sp.

Male. *Upperside*: dark brown. Forewing: a pale spot somewhat as in *L. massalia*, but rather larger and of different shape, placed obliquely across the wing, the middle portion occupying the basal half of space 3. *Underside*: very dark brown. Forewing: a pale discal band as on upperside but larger and reaching the dorsum. Hindwing: finely and evenly mottled. Both wings: termen much more undulating than in *L. massalia*.

Expanse: ♂ ♂ 1·03″.

Two males were obtained at Sebong, Manipur, in February and April.

The discal fascia on the underside of forewing and the undulating termen at once distinguish it from *L. massalia*.

PITHECOPS FULGENS, Doherty.

Several males and females of this beautiful species were obtained on the Irang and Lengba Rivers in the Western Manipur Hills in March and April and again in October and November.

It has only been hitherto recorded from Upper Assam, where Mr. Doherty obtained it at Margherita.

Sub-family—*Lycæninæ*.

UNA USTA, Distant.

Since recording the presence of this form within Indian limits, J. B. N. H. S., Vol. XXI, p. 593, I have taken numerous males in the Naga Hills and in Manipur. It occurs all along the cart road from Nichuguard to Manipur from the foot of the hills up to 5,000 ft. and also at Sebong in the Eastern Manipur Hills and on the Irang River, Western Manipur Hills. The female seems very rare and I have only secured one more, which is an intermediate form, taken at Sebong in November.

The upperside agrees with the extreme dry-season-form described in the J. B. N. H. S., Vol. XXI, p. 593, but on the underside all the dark spots are present. Two extreme dry-season males were obtained on the Irang River, Manipur, in November which agree with the dry season female above mentioned in the obsolescence of the dark spots on the underside.

CYANIRIS MUSINOIDES, Swinhoe.

Common in Manipur and the Naga Hills.

I found ♂ ♂ of this species very abundant at Kairong, Manipur, 3,400 ft., in July and hundreds were to be seen collected together on the cart road feeding on wet mud mixed with cowdung. Females fly at much higher elevations and I obtained a good number at Mao and near Kohima at 5,000 ft. and upwards.

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In March and April a few dry season forms were obtained in the Manipur Valley at 2,600 ft.

An hermaphrodit was taken at Takabama, Naga Hills, 7,000 ft. in August which has the right pair of wings *male* in character and the left pair *female*.

CYANIRIS BINGHAMI, Chapman.

A single male was obtained in Manipur in July. I failed to recognise it and sent it with a lot of other butterflies to Major W. H. Evans who on recognising it to belong to this species very kindly returned it to me. He unfortunately only put "Manipur" on the label and so the exact locality where it was taken must remain uncertain. Another male was subsequently taken at Sebong, Manipur, in April.

CYANIRIS MELÆNOIDES, n. sp. (Pl. III, Fig. 28 ♂).

Male: very near *C. melæna*, Doherty, from which it differs in the following respects:—

Upperside: Both wings: black border broader and therefore the blue discal area, brilliantly irridescent in some lights, slightly more restricted. *Underside*: Both wings: the submarginal series of spots further removed from the margin, larger and more irregular.

Female: *Upperside*: both wings very similar to the female of *C. puspa*. *Underside*: markings as in male.

The ground colour of the underside is pure *whitish-grey* as in the description of *C. melæna*, but specimens of the latter species in the de Niceville collection have the ground colour distinctly *brownish-grey*, but this may be due to the specimens being old.

Six males and a female were taken on the Irang River, Western Manipur Hills, in December; two males at the same place in January and a very small male in July. The small wet-season-form taken in July differs from the dry-season-form only in having the spots on the underside comparatively larger.

CYANIRIS DOHERTY, n. sp. (Pl. IV. Figs. 45, 46, w. s. and d. s. ♂ ♂).

Male. *Upperside:* Forewing: costal and terminal areas broadly black, extending to beyond a third of the dorsum from the tornus and filling the upper half of the cell; the rest of the wing greyish, shot with pale iridiscent blue in certain lights. Hindwing: almost entirely black brown with a very small discal patch of grey scales. *Underside:* very similar to *C. transpectus* wet-season-form except that the hindwing has an extra spot at the extreme base of interspace 7 agreeing in this respect with *C. puspa*; discal spot in interspace 7 not more prominent than spot in 6. The above is a description of the wet-season-form; the dry-season-form differs on upperside in being much paler with white discal patches on both wings and in having the dark terminal border on forewing narrower. *Underside:* markings as in the wet-season-form but rather smaller; the terminal markings not so distinct.

Expanse: ♂ ♂ 1·17″-1·2″.

Three wet season males were taken by my native collectors at Kirbari Naga Hills at 6,000 ft. in July, September and the beginning of October. A single male of the dry-season-form was obtained at the same place at the end of October. This is a very distinct form and on the upperside the wet-season-form looks rather like a very small and dark specimen of *C. vardhana*; on the underside however it is quite different and the markings are nearest to the wet-season-form of *C. transpectus* agreeing with it in having a spot at base of interspace 1 but differing in having an additional spot at

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the extreme base of interspace 7 and in the spot at the outer end of interspace 7 being subequal to spot in 6 and not larger and more prominent as in *C. transpectus.*

PHENGARIS ATROGUTTATA, Oberthur.

A good number of both sexes were obtained in the Naga Hills at 7,000 ft. in September. It should occur in Manipur, as it has been recorded from the Chin Hills which is still further South ; but I have failed to find it.

EVERES PARRHASIUS ASSAMICA, n. sub-sp.

Under the above name I propose separating the form of *parrhasius* from Assam and the Upper Chindwin from the typical form which occurs in South India and Ceylon ; it differs as follows :—

Male. *Upperside :* black border much broader on both wings. Female. *Upperside :* the discal greyish-blue patch on forewing much reduced, darker and hardly visible ; hindwing rather darker. *Underside :* similar.

A *parrhasius* form of an *Everes* was recorded by Watson from the Chin Hills under the name of *E. dipora,* J. B. N. H. S., Vol. X, p. 660. The form from N. E. India and Upper Burma is undoubtedly conspecific with the form from South India and Ceylon and only differs on the upperside as before mentioned.

EVERES ARGIADES DIPORA, Moore.

There are two forms of the *Argiades* group occurring in Manipur and the Naga Hills. They are probably *dipora,* Moore, and *diporoides,* Chapman, as I have similar specimens from the N. W. Himalayas, the habitat of these two forms. I however cannot identify them with certainty as I have not Chapman's description of *diporoides* by me and Moore's description of *dipora* fits both forms.

In the first form the ♂ is dull blue with a narrow black terminal border. It is variable in size ; the dry-season-form being sometimes very small, but the wet-season-form appears to average considerably larger than the second form, the ♂ of which is much brighter blue with a much broader black border to the termen.

There should be no difficulty in separating the *dipora* and *parrhasius* groups as the undersides are quite different. In the *dipora* group all the spots on the *underside* are *round and black.* In the *parrhasius* group the *only* spots that are *round and black* are the *two* in *space* 8, *one* in the *cell* and *one* on the *abdominal margin* of the hindwing ; the *other* spots are somewhat *linear and pale grey.*

CASTALIUS ROXUS ROXANA, de N.

C. roxana is undoubtedly a race of *C. roxus* and was described from the extreme dry-season-form. There are three well marked forms.

(*a*) The extreme dry-season or typical form. (*b*) An intermediate form which has the white bands narrower and a deep black border which has its inner edge slightly encroached upon by the white discal band. This form is almost exactly similar to a specimen of *C. roxus* I have from Upper Tenasserim. (*c*) A wet-season-form with white bands very narrow and black, outer margins broader, its inner edge more even.

Numerous specimens were obtained in Manipur both in the Eastern and Western Hills and a few at Nichuguard in the Naga Hills. Wet-season-forms were taken from April to November ; intermediate forms in December and again in March ; dry-season-forms from December to February.

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NIPHANDA CYMBIA, de N.

Decidedly a rare species in Manipur. Two males were taken at Sebong in February and March and three females on the Irang River in February.

ORTHOMIELLA PONTIS, Elwes.

Nine males taken in Northern Manipur Hills at 4,000-5,000 ft. in March and April and three females on Kabru, 8,400 ft. in April, May and June.

NACADUBA BHUTEA, de N.

According to Bingham the female is undescribed.

Female. *Upperside:* Forewing: costal and terminal margin broadly black; the remainder of the wing lilac grey shot with brilliant light blue in certain lights. Hindwing lilac grey; termen narrowly darker; tornal spot on underside faintly showing through. *Underside* slightly paler than in male; otherwise similar.

Sub-family—*Poritiinæ.*

PORITIA ERYCINOIDES, Felder.

Many males and four females taken at Sebong, Manipur, in February and March, June, October and November, and a single male at Saitu in the Manipur Valley. They in no way differ from specimens I have from Maymyo, Burma.

Sub-family—*Theclinæ.*

Genus ZEPHYRUS, Dalman.

Some of the forms of this genus are very hard to identify and I propose giving a key which I hope will be of some use, in determining doubtful forms. I have included all the known forms from within Indian limits so as to make the key as complete as possible. A portion of the key relating to the *Z. icana—Z. doherty* and *Z. mandara*, groups "C & D" has been copied from de Niceville's key for want of sufficient material. *Z. letha* has not been included as I have never seen this species and know it only by Watson's figure and description.

Key to the *Indian Species* of ZEPHYRUS.

A. Males and females. *Upperside:* alike; dark peacock blue with orange spots on forewing. *Underside:* alike except that the forewing of the female has an orange patch on the disc. 1. ZEPHYRUS PAVO, de N.

B. Males. *Upperside:* green. Females; light or dark blue.

1. 4. *Underside:* ♂ and ♀, ground colour white; sexes not alike; dark markings much more conspicuous in the ♀. Female. *Upperside:* dark peacock blue with an orange spot on forewing.

2. 3. *Upperside:* black border narrow. 2. ZEPHYRUS ATAXUS ZULLA, n. sub-sp.

3. 2. *Upperside;* black border broad. 3. ZEPHYRUS ATAXUS, Doubl. & Hewit.

4. 1. *Underside:* sexes alike; ground colour dark grey-brown. Female. *Upperside;* shining light blue, with faint orange spot on forewing. 4. ZEPHYRUS SUROIA, n. sp.

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C. "Males. *Upperside*: green, violet in some lights (*underside*: marginal bands on hindwing red). Females (as far as is known), brown with orange spots. Underneath sexes alike."

1. 2. Both sexes with discal band on underside hindwing broad, including dark line defining discocellular nervules, not outwardly prominently defined by silvery line. 5. ZEPHYRUS ICANA, Moore.

2. 1. Both sexes with discal band on underside of hindwing narrow quite separate from red line defining discocellular nervules, outwardly prominently defined by silvery line. 6. ZEPHYRUS DOHERTYI, de N.

D. "Male. *Upperside*: touched with obscure violet close to base of forewing only. Hindwing: entirely black. Female unknown." 7. ZEPHYRUS MANDARA, Doherty.

E. Males. *Upperside*: green. Females: (as far as is known) brown with orange spots on forewing. *Underside:* sexes not alike.

1. 10. Males. *Upperside*: brilliant metallia green. Green scales close together giving the wing a smooth even appearance.

2. 9. Both sexes underside hindwing with the sub-basal costal streak sometimes obsolescent.

3. 4. *Underside:* Hindwing: the sub-basal costal streak continued across the cell and reaching the lower edge; nearly always some red scales between the discocellular streaks on forewing. 8. ZEPHYRUS VITTATA, n. sp.

4. 3. *Underside:* Hindwing: sub-basal costal streak not crossing the cell, sometimes just entering it but generally stopping at its upper edge.

5. 8. *Underside:* Hindwing: basal area darker than area between discal and sub-terminal bands.

6. 7. *Upperside:* black border narrow. 9. ZEPHYRUS DUMOIDES, var. INTERMEDIA, n.

7. 6. *Upperside:* black border broad. 10. ZEPHYRUS DUMOIDES, n. sp.

8. 5. *Underside*: Hindwing: basal area not darker than area between discal and sub-terminal bands. 11. ZEPHYRUS DUMA, Hewitson.

9. 2. Both sexes: hindwing with the sub-basal costal streak wanting. 12. ZEPHYRUS KABRUA, n. sp.

10. 1. Males. *Upperside*: deep green, green scales further apart, giving the wings a powdery appearance.

11. 12. Large size, over 2″. *Underside* dull fuliginous black. 13. ZEPHYRUS ZOA, de N.

12. 11. Smaller, under 2″. *Underside* pale brown. 14. ZEPHYRUS DONI, n. sp.

F. *Upperside*: Males green, Females either brown with two bluish-white spots on forewing or grey blue on both wings. *Underside*: sexes alike.

1. 8. *Underside*: Hindwing: discal band more or less straight, even and continuous; if slightly uneven in interspaces 3 and 4, then portion in 4 placed more inwardly than portion in 3.

2. 5. *Underside*: ground colour pale silvery grey or grey brown.

3. 4. *Underside*: Hindwing: tornal ocelli black inwardly bordered with orange. 15. ZEPHYRUS BIRUPA, Moore.

4. 3. *Underside*: Hindwing: tornal ocelli black not inwardly bordered with orange. 16. ZEPHYRUS JAKAMENSIS, n. sp.

5. 2. *Underside*: ground colour bluish silvery white.

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6. 7. *Upperside*: Males: green, sometimes violet in certain lights. Hindwing: black border broad and not sprinkled with blue scales.
Underside: costal end of discal band on forewing conspicuously broader than tornal end. 17. ZEPHYRUS SYLA, Kollar.

7. 6. *Upperside*: Males: green, never tinted with violet. Hindwing: black border narrow and sprinkled with blue scales.
Underside: costal end of discal band on forewing not conspicuously broader than tornal end. 18. ZEPHYRUS ASSAMICA, n. sp.

8. 1. *Underside*: Hindwing: discal band distinctly irregular, either continuous or broken up into detached or semi-detached streaks.

9. 12. Hindwing with tails.

10. 11. Hindwing: *underside*: discal band continuous; portions in interspaces 4 and 5 projecting outwardly beyond portions in 3 and 6. 19. ZEPHYRUS KIRBARIENSIS, n. sp.

11. 10. *Underside*: Hindwing: discal band not continuous but composed of semi-detached streaks. Portions in interspaces 4 and 5 not as in 10 but more inwardly placed than portions in 3 and 6. 20. ZEPHYRUS PAONA, n. sp.

12. 9. Hindwing without tails. *Underside*: discal band irregular and composed of detached streaks. Portions in interspaces 4 and 5 placed more inwardly than portion in 3 but more outwardly than portion in 6. 21. ZEPHYRUS KHASIA, de N.

G. *Upperside*: grey blue with two white costal spots on forewing. Sexes alike, above and below. 22. ZEPHYRUS ZIHA, Hewitson.

ZEPHYRUS PAVO, de N. (Pl. IV, fig. 29, ♀).

A ♂ and ♀ taken above Kirbari, Naga Hills, at about 7,000 feet in June. Two males at the same place in July. A worn female above Kohima in September and another damaged female above Jakama during the same month.

The female differs from the male in having on the underside of the forewing an orange discal patch beyond the cell in interspaces 2 and 3; it is otherwise similar.

Mr. de Niceville's description of the female applies really to the male as he makes no mention of the orange discal patch on the underside of the forewing.

Doherty obtained a male of this rare species at Margherita in Upper Assam at only 400 feet according to Mr. de Niceville; if this is really so it is very low for a *Zephyrus* to be found. It is highly probable that there has been a mistake and that 400 feet should really read 4,000 feet; even that is very low for a *Zephyrus* in Assam. I have never taken one below 6,000 feet.

ZEPHYRUS ATAXUS ZULLA, n. sub-sp.

A female taken on Paona Hill above Kirbari, Naga Hills, at 7,000 feet at the end of June and a male at the same place in the middle of July. On the upperside the male differs from Murree specimens of *Z. ataxus* in having the apical and terminal black border on both wings conspicuously narrower. The female on the upperside does not differ from the typical form. *Underside*: both sexes have the dark markings more distinct.

ZEPHYRUS SUROIA, n. sp. (Pl. IV, figs. 30, 31. ♂, ♀).

Male. *Upperside*: both wings rather dark shining green. Forewing: a black terminal border continued narrowly to middle of costa, broad at apex narrowing towards the tornus. Hindwing: costa broadly dark brown;

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termen narrowly darker brown or black; a narrow blue terminal line, well marked in interspaces 1 and 2 becoming obsolescent towards the apex; a few scattered blue scales on basal half of interspace 7; dorsal margin broadly brown; anal lobe black. *Underside*: brown with all the pale markings bluish-white. Forewings: a short pale narrow band at the end of the cell; sometimes one or two pale spots in the cell; a post discal bluish-white band from just below the costa to vein 2, inwardly recurved and produced upwardly as a fine rather indistinct line to vein 4 which it strikes a little beyond the lower end of the pale streak at the end of the cell, the ground colour between these two pale lines dark brown; a dark brown terminal border, very dark towards the tornus, inwardly bordered with a bluish-white rather diffuse band, and divided by two narrow marginal bluish-white lines, the outer one very indistinct. Outer half of interspace 1 greyish. Hindwing: a sub-basal bluish white band from vein to base of vein 2; a discal transverse band from vein 8 straight as far as vein 2 where it zigzags and ending at the middle of the dorsum; sometimes a pale bluish-white spot between these two bands in interspace 7; a short bluish-white marginal streak near base of dorsum; a sub-marginal bluish white band with diffuse edges, recurved along the dorsum where it is very narrow and quite blue; a terminal row of diffuse bluish-white lunules; a large black tornal spot ringed with rufous yellow; anal lobe black, sometimes sprinkled with a few rufous yellow scales, crowned with rufous yellow which colour is continued for a short distance along the dorsum; and lastly a fine terminal bluish-white line. Cilia white; tail black tipped with white.

Female. *Upperside*: Forewing: costal margin black, narrow near the base widening out towards the apex; apex and termen broadly black narrowing towards the tornus; remainder of wing bright sky-blue with purple reflections in some lights; two very indistinct reddish patches in interspaces 3 and 4; a black streak on the discocellulars. Hindwing: costal margin broadly black-brown; termen narrowly black; the remainder of the disc bright blue as on forewing, not quite filling interspace 5; outer portions of veins 2 and 3 well indicated by black scales; a fine greyish-blue terminal line becoming obsolescent towards the apex. *Underside*: a small indistinct reddish spot on the bluish-white marginal line in interspace 2 of forewing. Otherwise as in male.

Expanse: ♂ ♂ 1·57″—1·73″; ♀ ♀ 1·67″—1·76″.

A good number of males and two females were taken by Major Evans and my native collectors on Suroifui mountain in the Eastern Manipur Hills at about 8,000—9,000 feet in June and July, and another female and several males in August or September.

ZEPHYRUS VITTATA, n. sp. (Pl. IV, figs. 42, 43, ♂, ♀).

Male. *Upperside*: bright green with deep blue reflections in certain lights. Forewing: costal margin very narrowly black towards the apex; apex and terminal margin rather broadly black. Hindwing: costal margin broadly black; terminal margin black, rather broader than on the forewing, and widening outwards the tornus. *Underside*: grey-brown. Forewing: costal margin and outer two-thirds darker than the ground colour; discocellulars defined by two bluish-white lines, between which the ground colour is darker brown with some orange scales next to the outer line. A post-discal transverse broad pale band from costa to vein 2, where it ends in a point, inwardly sharply defined by a narrow whitish line, a subterminal whitish line. Hindwing: a sub-basal bluish-white line from vein 8 to lower edge of the cell; discocellulars defined by a bluish-white line, a post discal narrow bluish-white line rather straight as far as vein 2 where it forms a W and then recurves back to the middle of the dorsum; a subterminal

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rather pale line, outwardly bordered with dark brown, coalescing with the postdiscal line at vein 2 and recurved along the dorsum for a short distance; the area between the postdiscal and subterminal bands and dorsal area thinly irrorated with bluish-white scales; the terminal border broadly and thickly irrorated with similar scales; a black spot near tornus ringed with dark ochreous-red; anal lobe black sprinkled with a few ochreous red scales and crowned broadly with the same colour which is continued as a narrow streak along the dorsum for a short distance. Cilia greyish. Tails black tipped with white. Female. *Upperside*: deep brown becoming blackish towards outer half of forewing. Forewing: three contiguous large orange spots beyond the cell and in interspaces 1 and 2. Hindwing: unmarked. *Underside*: browner than the male. Forewing with three orange spots as on upperside; markings on both wings otherwise similar.

Expanse. ♂♂ 1·6″—1·69″; ♀♀ 1·66″—1·73″.

This species occurs both in Manipur and the Naga Hills. In Manipur several males and females were taken on Kabru, 8,400 feet in July and August and at Suroifui, 8,000—9,000 feet in August. In the Naga Hills numerous males were taken at Kirbari in June and July and several females at Phesima and Takabama in July and August at about 7,000 feet.

ZEPHYRUS DUMOIDES, n. sp. (Pl. IV, Fig. 39, ♂).

Male. *Upperside*: very similar to *Z. vittata*, mihi, but the black border on both wings broader. *Underside*: Forewing: grey brown; a dark brown bar at the end of the cell bordered on both sides with white; a narrow postdiscal white band from costa to vein 2 inwardly broadly bordered with dark brown; a dark subterminal line broadening towards the tornus; a slightly paler terminal border divided from the subterminal dark line by a rather indistinct and very narrow whitish line. Hindwing: basal two-thirds as far as the postmedian transverse whitish band dark brown; a subcostal bluish-white streak near base of interspace 7; the discocellulars marked with brown and inwardly indistinctly bordered with paler colour; a rather straight narrow postmedian whitish band from apex to vein 2 where it recurves and forms a "W" and ends on the middle of the dorsum; a subterminal dark brown band, inwardly faintly bordered with whitish, the area between this and the postmedian whitish band irrorated with pale scales and conspicuously paler than the basal two-thirds of the wing; termen rather paler than the subterminal dark band and thickly irrorated with pale scales which are distinctly blue towards the tornus; a black spot near the tornus encircled with dark red; anal lobe black crowned with dark red, which colour is indistinctly continued for a short distance along the dorsal margin, and bearing a few blue scales posteriorly. Female. *Upperside*: very similar to the female of *Z. duma*. *Underside*: differs from *Z. duma* in being darker. Forewing: the discocellulars generally not so well marked. Hindwing: the terminal area not so conspicuously irrorated with pale scales.

Expanse: ♂♂ 1·7″—1·8″; ♀♀ 1·65″—1·82″.

Numerous males and a good series of females were obtained at Kabru, Manipur, at 8,400 feet in July and a few in June and August.

? Var. *intermedia*, n. This is on the whole a smaller insect than *Z. dumoides* and has on the upperside the black terminal border much narrower; in this respect being almost identical with *Z. vittata*. The underside is however almost exactly the same as *Z. dumoides*, mihi. The difference in size and in the width of the black border appears to be fairly constant in the large series of set males before me and placed side by side with *Z. dumoides*, mihi, appears well marked; but without an examination of the genitalia I do not like to separate it. The females are exactly like *Z. dumoides* female and only differ in size.

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Expanse: ♂♂ 1·56″—1·72″; ♀♀ 1·63″—1·65″.

Z. dumoides has only been taken in Manipur on Kabru, 8,400 feet.

Z. intermedia is not uncommon in Manipur where it has been taken on Kabru, 8,400 feet, and on Suroifui, 8,000—9,000 feet, in July. It occurs rarely in the Naga Hills where a few specimens, 1 ♂ and 3 ♀♀, were taken at Kirbari, 7,000 feet, in July.

Z. duma, a closely allied species, is the prevailing form in the Naga Hills, it extends into Manipur where it is very rare, only two males being taken on Kabru in three years.

ZEPHYRUS DUMA, Hewitson.

Specimens from the Naga Hills agree exactly with specimens from Sikkim. It is by no means uncommon and has been taken on several separate ranges at elevations of 7,000 feet and over from June to September. As before mentioned it is very rare in Manipur.

Z. duma can always be separated from both *Z. dumoides* and *Z. intermedia* by the green being of a more brassy shade and also from the former by the much narrower terminal border, and from the latter by its larger size. On the underside it is much paler and more silvery and on the hindwing the basal area as far as the postmedian band is not conspicuously darker than the area between the postmedian and subterminal bands, which is a very marked feature in other two closely allied forms.

ZEPHYRUS KABRUA, n. sp. (Pl. IV, Fig. 41, ♂).

Male. *Upperside*: both wings brassy green as in *Z. duma*. Forewing: costal margin near apex, apex and terminal margin narrowly black, very narrow near the tornus. Hindwing: costal margin broadly and terminal margin narrowly black; a terminal narrow blue line on either side of the tail, dorsal margin brown. *Underside*: pale silvery fawn colour. Forewing: discocellulars marked with brown; a post discal brown band reaching vein 2; a pale silvery broad subterminal band from costa to vein 2 broadest at costa; a terminal brown band divided by a marginal rather indistinct pale silvery line. Hindwing: a brown line closing the cell often joined to the median brown line at vein 4; a median brown line commencing at the costa and continued as a straight line to vein 2 where it forms a "W" and recurves ending near the middle of the dorsal margin; this band is sometimes broken at veins 4 and 7 and the lower portion often appears to be in continuation of the discocellular brown line, a broad costmedian pale silvery band; a subterminal broad brown band irrorated outwardly with silvery scales; a terminal fine white line outwardly bordered by an anteciliary brown line; a black submarginal spot in interspace 2 ringed with orange; anal lobe black crowned with orange, which colour is extended for a short distance along the dorsal margin and inwardly lined with silvery. Cilia greyish-brown. Female. *Upperside*: brown. Forewing: three orange spots on disc beyond the cell and in interspaces 2 and 3, the lower spot rather indistinct. Hindwing: unmarked. *Underside*: very similar to *Z. duma* ♀ but no pale markings near the base of interspace 7 or on the discocellulars.

Expanse: ♂♂ 1·33″—1·67″; ♀ 1·46″.

Many males were taken on Kabru peak, Manipur, 8,400 feet, in June and July, and at Phesima Naga Hills at 7,000 feet, in July and August; a single female taken at Takahama, Naga Hills, 7,000 feet, in August.

This form can at once be distinguished from *Z. duma* and *Z. dumoides* by its very much smaller size and by the silvery fawn colour of the underside which entirely lacks on the hindwing any mark in interspace 7, nearly

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always clearly visible in its allies. The blue line near tornus of upper hindwing also at once distinguishes it.

ZEPHYRUS ZOA, De Nicéville.

Many males were taken on Kabru, Manipur, at 8,400 feet, in July and August, most of the specimens in the latter month were worn and useless. Many females were taken on Kabru which undoubtedly belong to both this species and to *Z. dumoides*, they vary a good deal *inter se*, but I can find no certain character by which to assign them to their respective males. I am however inclined to think that specimens which have the postmedian narrow white bands on both wings very narrow and straight and the terminal area of the hindwing below very sparsely irrorated with pale scales should be assigned to this species. This species was originally described by De Nicéville from a single male obtained by Mr. A. V. Knyvett on Tiger's Hill above Darjeeling at 8,000 feet elevation on 26th June 1888 and has not again been met with by any collector; De Nicéville subsequently was of the opinion that it was a sport of *Z. duma*. It is however undoubtedly a good species and the males are very constant in the extent of the powdery dark green scales, some males however have the green scales tinted with violet in certain lights. It appears to be an extremely local species and I have only obtained it on top of Kabru mountain. The Manipur form differs from De Nicéville's description and figure in not having the black border of forewing of even width as far as interspace 6; at vein 4 the black border widens out, the green scales being confined to the base of interspace 4 and 5 and quite wanting in interspace 6, giving the apical area a very black appearance; it is however not advisable to separate it as a race until the Sikkim form is rediscovered and found to be constant in the even width of the black border of forewing.

It agrees much better with De Nicéville's description and figure of *Z. zoa* than does the next species.

ZEPHYRUS DONI, n. sp.

Male. *Upperside*: dull powdery green turning to purple in certain lights and almost invisible in others. Forewing: with a broad even black terminal border. Hindwing: broadly black along the costa, termen and dorsum, the green scales being confined to the disc as in *Z. zoa*. *Underside*: both wings pale brown. Forewing: discocellulars faintly marked on either side with white; a post discal narrow white band, inwardly bordered with dark brown, ending at vein 2; a subterminal white line inwardly bordered with dark brown which widens outwards the dorsum. Hindwing: discocellulars unmarked, a post discal narrow white band bordered inwardly with dark brown as on forewing ending in a "W" at the tornal angle; terminal area darker brown with two subterminal white lines and a terminal line of the same colour on it. Tornal area orange inwardly bordered with black, with a large black spot in interspace 2 and some black scales in interspace 1.

Expanse: ♂ 1·4″.

A single male taken on Suroifui, Manipur, 8,000—9,000 feet, in July.

Its nearest ally appears to be *Z. zoa* from Manipur which however has not yet been taken on Suroifui. It differs from that species in its much smaller size; on the upperside the green scales are not so powdery, the black border is wider in proportion to the breadth of the wings and is of even width from the dorsum to vein 6 in *Z. zoa* from Manipur; the black border widens out markedly at vein 4 filling the apex. On the underside it is a much paler brown. Forewing: the discocellulars not so well marked. Hindwing: the sub-basal streak in interspace 7 wanting; the discocellulars unmarked; and the two subterminal white lines better defined.

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The green scales when seen through a microscope are broader than they are in the Manipur *Z. zoa*, and consequently closed together.

ZEPHYRUS JAKAMENSIS, n. sp. (Pl. IV, Figs. 32, 33, ♂ ♀).

Male. *Upperside*: both wings bright shining green. Forewing: termen broadly margined with black as in *Z. birupa*. Hindwing: costa broadly brown black; termen narrowly bordered with black and irrorated with blue scales. Dorsal margin brown, greyish towards the base. Underneath very similar to *Z. syla* but the colour greyish silvery and not bluish silvery, all the markings narrower; no sub-costal streak in interspace 7; the two submarginal spots on either side of the tails pure black with no trace of any orange. Female. *Upperside*: very similar to *Z. syla* but the ground colour paler. The forewing has the terminal black border inwardly produced for some distance along the dorsal margin and consequently the bluish discal area is smaller; apex of cell and outer half of interspace whitish, the area beyond the end of the cell and interspaces 2 and 3 almost white. Hindwing: the bluish-grey scales more conspicuous and extensive almost covering the entire wing below vein 6 with the exception of a very narrow terminal area; veins brown and conspicuous. *Underside* similar to male.

Expanse: ♂ ♂ 1·4″—1·63″; ♀ ♀ 1·45″.

Two males were taken at Phesima in the Naga Hills at 7,000 feet in June and several more males and a single female at the same place in July. Three males taken on Suroifui at about 8,000 feet in July. It can at once be distinguished from its nearest allies *Z. birupa*, *Z. syla* and *Z. assamica*, Mihi, described below, by the complete absence of any red in the vicinity of the tornal black spots.

ZEPHYRUS ASSAMICA, n. sp.

Male. *Upperside*: very similar to *Z. syla* but pure green and never tinted with bronze. Hindwing: terminal black border rather narrower and inwardly irrorated with blue scales. *Underside*: markings on the whole finer than in *Z. syla* especially on the hindwing. Forewing: costal end of post-discal band not conspicuously broader than the tornal end, generally narrower. Hindwing: tornal black spots much smaller, the inner one often obsolescent, and orange markings not nearly so conspicuous. Female. *Upperside*: Forewing: ground colour darker, otherwise similar. Hindwing: darker, of the same colour as the forewing, and much more extensive than in ♀ *Z. syla*, generally quite reaching the termen but sometimes just stopping short of it. *Underside*: as in male.

Expanse: ♂ ♂ 1·49″—1·58″; ♀ ♀ 1·31″—1·63″.

A good number of males and females were taken in the Naga Hills at about 7,000 feet in July and August, and a few in Manipur during the same months on Kabru, 8,400 feet, and on Suroifui at about 8,000 feet. A ♂ specimen from Sikkim has been given me by Mr. E. Ollenbach. This form is probably an eastern race of *Z. syla*.

ZEPHYRUS KIRBARIENSIS, n. sp. (Pl. IV, Figs. 36, 37, ♂ ♀).

Male. *Upperside*: very similar to the preceding form but the black border on forewing is very much narrower. Hindwing: black border rather narrower especially near the tornus and the blue scales more restricted, generally only visible as a narrow line on either side of the tail. *Underside*: Forewing: very similar. Hindwing: very similar but the discal band is very irregular, the portion beyond the cell in interspaces 4 and 5 projecting *beyond* the portions on either side in interspaces 3 and 6. Female. *Upperside*: very similar to the female of the preceding form. *Underside*: as in male.

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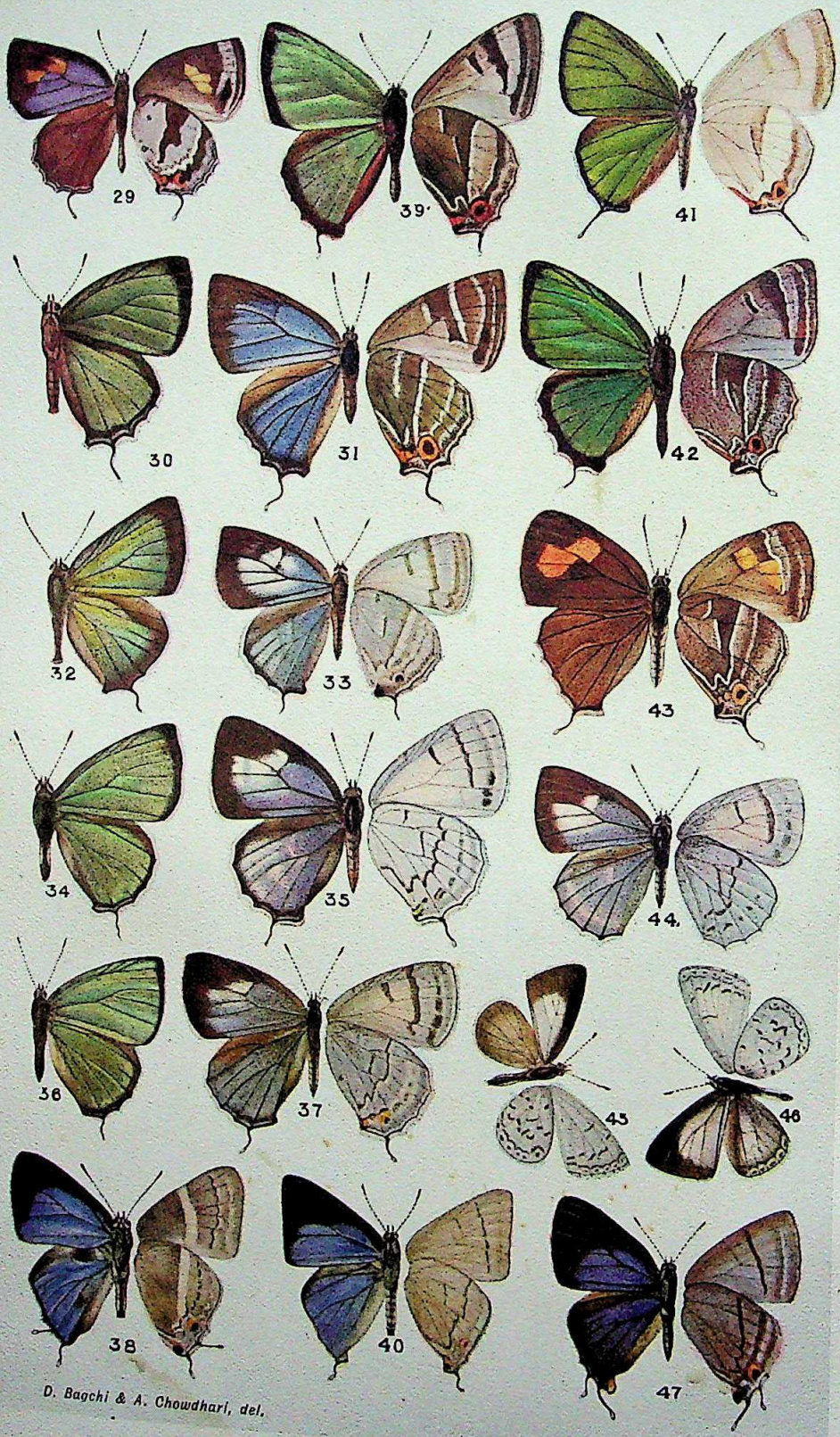

D. Bagchi & A. Chowdhari, del.

Butterflies of Manipur and the Naga Hills.

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NOTES ON SOME NEW AND INTERESTING BUTTERFLIES FROM MANIPUR AND THE NAGA HILLS.

Explanation of Plate IV.

Fig. 29.—Zephyrus paro, de N. ♀.

" 30.—Zephyrus surcia, n. sp. ♂.

" 31.— " " " ♀.

" 32.—Zephyrus jaiksmensis, n. sp. ♂.

" 33.— " " " ♀.

" 34.—Zephyrus paona, n. sp. ♂.

" 35.— " " " ♀.

" 36.—Zephyrus kinbarienais, n. sp. ♂.

" 37.— " " " ♀.

" 38.—Cremera coloides, n. sp. ♂.

" 39.—Zephyrus danoides, n. sp. ♂.

" 40.—Tajuria sebonga, n. sp. ♂.

" 41.—Zephyrus kabrua, n. sp. ♂.

" 42.—Zephyrus virtana, n. sp. ♂.

" 43.— " " " ♀.

" 44.—Zephyrus khasia, de N. ♀.

" 45.—Cyanitis dohertyi, n. sp. ♂, w. s. f.

" 46.— " " " ♂, d. s. f.

" 47.—Tajuria thydia, n. sp. ♂.

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NOTES ON SOME NEW AND INTERESTING BUTTERFLIES FROM MANIPUR AND THE NAGA HILLS.

Explanation of Plate IV.

Fig. 29.—Zephyrus paro, de N. ♀.

,, 30.—Zephyrus suroia, n. sp. ♂.

,, 31.— ,, ,, ,, ♀.

,, 32.—Zephyrus jakamensis, n. sp. ♂.

,, 33.— ,, ,, ,, ♀.

,, 34.—Zephyrus paona, n. sp. ♂.

,, 35.— ,, ,, ,, ♀.

,, 36.—Zephyrus kirbariensis, n. sp. ♂.

,, 37.— ,, ,, ,, ♀.

,, 38.—Camena cotoides, n. sp. ♂.

,, 39.—Zephyrus dumoides, n. sp. ♂

,, 40.—Tajuria sebonga, n. sp. ♂.

,, 41.—Zephyrus kabrua, n. sp. ♂.

,, 42.—Zephyrus vittata, n. sp. ♂.

,, 43.— ,, ,, ,, ♀.

,, 44.—Zephyrus khasia, de N. ♀.

,, 45.—Cyaniris dohertyi, n. sp. ♂. w. s. f.

,, 46.— ,, ,, ,, ♂. d. s. f.

,, 47.—Tajuria thydia, n. sp. ♂.

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Expanse: ♂ ♂ 1·45″—1·58″; ♀ ♀ 1·5″—1·59.″

A few males and females taken on Kabru, Manipur, 8,400 feet, in July and August, and several males and females in the Naga Hills at Kohima, Phesima and Kirbari at about 7,000 feet from July to September, a single female at Jakama in October and a single male at Kohima in November. A ♀ of this species was originally taken at Kirbari in the Naga Hills and recorded in the J. B. N. H. Soc., Vol. XXI, p. 598, as being very near to *Z. syla.* I did not like to separate it on a single specimen ; it is however a perfectly good species. The shape of the discal band on the underside is very characteristic and at once distinguishes it from its nearest ally *Z. assamica*, Mihi, which has the discal band generally straight and if not straight the portions beyond the cell in interspaces 4 and 5 are somewhat more inwardly placed than portions in 3 and 6 and not outwardly as in the present form. The 12 ♂ ♂ and 8 ♀ ♀ now before me show no variation in the shape of this band.

ZEPHYRUS PAONA, n. sp. (Pl. IV, Fig. 34, 35, ♂ ♀).

Male. *Upperside*: both wings very similar to *Z. kirbariensis.* Hindwing with a blue terminal line on either side of the tail. *Underside*: bluish silvery white. Forewing : a brown streak closing the cell ; a postdiscal narrow brown band consisting of semi-detached streaks ; a very indistinct subterminal band darker than the ground colour ending in distinct black spots near the tornus, a very indistinct terminal line slightly darker than the ground colour and lastly an anteciliary dark narrow line. Hindwing : a narrow sub-basal brown streak in interspace 7 not quite reaching its lower edge ; another similar streak closing the cell, a very sinuous irregular discal band, deeply excavated in interspace 1 and then sharply recurved to the middle of the dorsum ; a subterminal band of indistinct dark lunular spots, rather more conspicuous in interspace 1 and 2 where they are inconspicuously bordered posteriorly with orange ; a terminal row of very inconspicuous spots slightly darker than the ground colour and lastly an anteciliary narrow dark line. Cilia white. Female. *Upperside*: very similar to the ♀ of *Z. kirbariensis*, Mihi, but the discal white spots are much more conspicuous ; interspaces 2 and 3 being completely white from the base to the terminal black border. Hindwing : also very similar but interspaces 4, 5 and 6 are whitish towards the termen ; a distinct brown terminal border ; an anteciliary dark line inwardly bordered with blue on either side of the tail. *Underside* similar to male but the discal bands on both wings rather more heavily marked and more distinct.

Expanse: ♂ 1·71″; ♀ 1·67″.

A single male was taken on Kabru Mountain, Manipur, 8,400 feet, in June, and a female during the same month on Paona Peak at about 8,000 feet. This beautiful species can at once be distinguished from its nearest ally *Z. kirbariensis*, Mihi, by the form of the discal band on the underside of the hindwing which at its anterior end consists of semi-detached lunular streaks, the streak in interspace 6 projecting beyond those in interspaces 4, 5 and 7; in *Z. kirbariensis*, the discal band is continuous at its anterior end and the portions between the veins are straight, the portion in interspace 6 does not project outwardly but is more inwardly placed than portions in 4 and 5.

ZEPHYRUS KHASIA, de N. (Pl. IV., Fig. 44, ♀).

Female. Very similar to *Z. kirbariensis* ♀ on the upperside and cannot be distinguished from it except by the absence of the tail on the hindwing. *Underside*: exactly as in the male. This species has hitherto been only known by a single male taken in the Khasia Hills a long time ago. Its

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re-discovery is therefore very interesting. A large series of males and females were taken by my native collectors in the Naga Hills at Phesima and Kirbasi in July and August and a few in September and October. Two males and a single female were taken at Suroifui, Manipur, at 7,000-8,000 feet in June and July.

The ♀♀ of the *syla-khasia* group are all very much alike on the upperside, but fortunately the markings on the underside are constant and distinctive and so there is no difficulty whatever in separating them.

THECLA SAITUA, n. sp. (Pl. III, Fig. 25, ♀).

Female. *Upperside*: dull brown. Forewing: unmarked. Hindwing: a black submarginal spot in interspace 2 irrorated with a few pale scales; anal lobe black irrorated with bluish-white scales and crowned with white; a dark anteciliary line inwardly margined with white towards the tornus. Two narrow tails, the upper one short, the lower one long, black tipped with white. *Underside*: ground colour pale buff. Forewing: discocellulars indistinctly marked with white; a very narrow white postdiscal line margined with brown and broken at veins 2 and 4, a submarginal row of black spots in interspaces 1-5; the one in interspace 2 the largest, its outer half orange; an anteciliary black line inwardly bordered narrowly with white. Hindwing: a white streak closing the cell bordered on both sides with darker colour; a postdiscal narrow white band as on forewing broken at vein 4 and forming a "W" and ending on the tornus; a submarginal row of lunular orange spots inwardly crowned with black and bordered inwardly and outwardly with white, a large black spot in interspace 2 contiguous to the orange lunule; anal lobe black; apex of interspace 1 irrorated with bluish-white scales; an anteciliary dark line inwardly margined with white. Cilia: basal half white, outer half brown. Eyes hairy.

Expanse: ♀ 1·3″.

A single female was taken at Saitu village, 4,000 feet at the Northern end of the Manipur Valley, in May. In general appearance it is very like to *T. sassanides* but can at once be distinguished by the two tails on the hindwing.

ILERDA MOOREI, Hewitson.

Amongst numerous specimens of *Ilerda androcles* taken by my native collectors at Suroifui, Manipur, were two specimens very near *I. moorei*. They are slightly paler than typical specimens from Sikkim but are pure blue and never green in any light. They may possibly be an aberration of *androcles* but are probably an eastern race of *moorei*. My collectors were collecting near Suroi village from 5,000 feet to 9,000 feet and these two specimens may have been taken at the summit of Suroifui at about 9,000 feet which would be too high for *androcles* but not for *moorei* which flies at high altitudes in Sikkim.

APHNÆUS SANI EVANSII, n. sub-sp.

In my "Notes on Butterflies from the Naga Hills," published in the J., B. N. H. Soc., Vol. XXI, page 600, and pl. ii., fig. 5, No. 335, I recorded and figured a form of *Aphnæus* near to *A. sani*. I have since compared this form with specimens of *A. sani* in the DeNicéville collection and find that they agree in every respect except that they lack the red spot on upper forewing which is present in all DeNicèville's specimens from Sikkim. I have since taken eight more ♂♂ in the Naga Hills in June, September and October and a dry-season ♂ at Sebong, Manipur, in April. They all lack the red spot completely and I have therefore under the above name separated the Assam and Burma race from the Sikkim form.

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Sub-family—*Arhopalinæ.*

MAHATHALA AMERIA, Hewitson.

A single female taken at Nichuguard, Naga Hills, in March, and two more at the end of April or beginning of May.

APPORASA ATKINSONI, Hewitson.

A single female taken by my native collector at Sebong, Manipur, at the beginning of June.

I believe this species has not previously been recorded further north than Tenasserim.

IRAOTA ROCHANA, Horsfield.

Eight males of this beautiful species were obtained near Sebong, Manipur, in April, June, November and December.

So far only recorded from Mergui within Indian limits.

IRAOTA TIMOLEON, Stoll.

Males very common in the Manipur Valley. Females appear to be very rare and none were taken in the Valley itself; one was obtained at Sebong in July, another female was obtained at Nichuguard, Naga Hills, in May: this female has only one tail and resembles the male in this respect; the other tail is not broken off. This species appears to be very variable; typical *timoleon* being connected with typical *mæcenas* by intergradations. *Mæcenas* forms were taken from January to July. Intermediate forms, May to July and *timoleon* forms, June to October.

ZINASPA DISTORTA, De N.

Not uncommon in Manipur during February and March; rather scarce during the wet-season.

MOTA MASSYLA, Hewitson.

Four males and numerous females taken at Sebong and on the Irang River, Manipur, from January to July at low elevations. A single female was also taken at Kirbari, Naga Hills, at about 6,000 feet in June. This species amongst the ♀♀ seems to vary greatly in colouring and size. My smallest ♀, taken in January, being only 0·9″ and my largest, taken in June, 1·48″.

The males appear to be very rare.

ARHOPALA CAMDEO, Moore.

Four males taken at Sebong, Manipur, in April.

ARHOPALA APHA SUFFUSA, n. sub-sp.

This form differs from typical *apha* in the DeNicéville collection in having the underside suffused with lovely pink. Three males and a female taken at Sebong in June.

ARHOPALA SILHETENSIS, Hewitson.

Two males of this rare species were taken at the foot of the Naga Hills in October and November and two males and two females at Sebong, Manipur, in March and April.

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ARHOPALA ANARTE, Hewitson.

Two males of this very rare species were obtained on the Irang River, Manipur, in May and July.

Major W. H. Evans gives the habitat of this form as Cachar, Burma, but does not state who obtained it previously so far north as Cachar. Bethune-Baker and De Nicéville do not record it further north than Myitta, Tenasserim. It is a very beautiful species.

ARHOPALA AGADA, Hewitson.

Numerous males and three females taken at Sebong, Manipur, in April.

These specimens are somewhat darker underneath than examples from Burma in the De Nicéville collection.

In the J., B. N. H. S., Vol. XXI, p. 597, I erroneously recorded this species as having been taken in the Naga Hills. The specimens referred to were really *A. bazalus*.

ARHOPALA EUMOLPHUS, Distant.

Five males and three females of typical *eumolphus* were obtained at Imphal, Sebong, and on the Cachar Road, Manipur, from November to April. The race *hellenore* is very common at the same places.

ARHOPALA APIDANUS AHAMUS, Doherty.

Two males and two females taken at Nichuguard; Naga Hills, from October to January, and a male at Sebong, Manipur, in April.

ARHOPALA ADRIANA, De N.

A single female taken at Imphal, Manipur, in August.

ARHOPALA ABSEUS, Hewitson.

Five specimens taken at Sebong, Manipur, in April and another on the Irang River, Western Manipur Hills, in October.

ARHOPALA CHINENSIS, Felder.

Very common in the Manipur Valley, a single female was also taken in the Naga Hills at 5,000 feet in September.

ARHOPALA ARESTE, Hewitson.

Five males and four females taken at Imphal from September to March and a female on the Irang River, Manipur, in February. A pair taken in the Naga Hills at 5,000 feet in August and October and a female at Nichuguard in December.

ARHOPALA BAZALUS, Hewitson.

Not uncommon in Manipur from the foot of the Hills up to 5,000 feet. In the Naga Hills a fair number were obtained at about 5,000 feet.

ARHOPALA AGRATA, De N.

Two males which agree with specimens in the De Nicéville collection were obtained at Sebong, Manipur, in March and April, two males and eight females at the same place in July and a pair in October.

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ARHOPALA ARATA, n. sp.

A male of a form which appears to be new was obtained on the Lengba River, Western Manipur Hills, and two more at Sebong, Eastern Manipur Hills, in March and April. It agrees with nothing in the De Nicéville collection.

The upperside is similar to specimens of *A. arao*, Hewitson, and the underside to *A. agrata*, De N., in the De Nicéville collection.

ARHOPALA KHAMTI, Doherty.

A single male taken at Sebong in May agrees with specimens in the De Nicéville collection.

ARHOPALA RAMA, Koli.

Common at low elevations in Manipur. The breadth of the black terminal border of the forewing is variable.

ARHOPALA, sp. ?

Three males and two females of a form intermediate between *A. rama* and *A. hewitsoni* taken in Manipur and the Naga Hills from March to July.

ARHOPALA HEWITSONI, Bethune-Baker.

A pair taken at Sebong in June.

ARHOPALA ALEMON, De N.

Numerous males of the dry-season-form taken at Sebong, Manipur, in January and February and a few at Imphal in May; and numerous wet-season-forms at Sebong from June to January. The sexes hardly differ; the female has the terminal black border on forewing very slightly broader and the black tooth at the end of the cell more pronounced. This tooth is nearly always to be seen in the male but is glossed over with purple. In two dry-season males the purple gloss has entirely obliterated the black tooth.

From the dates of capture it will be seen that typical wet-season-forms fly on well into the cold weather. The black border on the forewing is broader in the wet-season-form than in the dry-season-form.

ARHOPALA COMICA, De N.

Two females of this curiously marked species were obtained at Sebong, Manipur, in March and agree exactly with De Nicéville's type. Mr. Bethune-Baker believed this to be a sport of *A. dodonea* (T.Z.S., 1903, p. 134). The type I believe was then unique. The tail is much longer than it is in *dodonea* and of a different shape. I believe it to be a good species.

ARHOPALA TOUNGUVA, G. S.

A large series of males and females obtained at Sebong, Manipur, in June which agree with specimens taken by Mr. Ellis at Kankerait, Shan States, in May and at Tangbingon, Upper Burma, in December. The males differ considerably from eight males I have from Rangoon, Lower Burma, taken in April, in having on the upperside the blue much duller and the black border slightly broader; and on the underside in being paler and not so suffused with pink.

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ARHOPALA PARAMUTA, De N.

Rare in Manipur. A few specimens taken at low elevations in February and April and a female at Imphal in July.

ARHOPALA PERIMUTA, Moore.

Common in Manipur at low elevations in the cold weather; a pair also taken at Sebong in July.

ARHOPALA ABERRANS, De N.

Three males and two females taken at Sebong, Manipur, in January and February; and two males and numerous females taken at the same place in July.

ARHOPALA BIRMANA, Moore.

Three males (dry-season-form) taken at Sebong, Manipur, in February and at April and four males and numerous females of the wet-season-form taken at the same place in July.

? ARHOPALA ARIEL, Doherty.

A very large series of both sexes of an *Arhopala* which may be *ariel* were taken at Sebong from November to April. They differ from both Elwes' and Bethune-Baker's figures in having the black border on both wings not quite so broad. The underside is exactly similar to that of *A. birmana.*

ARHOPALA ZEPHYRETTA, Doherty.

A single male taken at Nichuguard, Naga Hills, in May.

ARHOPALA GANESA WATSONI, Evans.

A male and four females taken at Suroifui, Manipur, 7,000-9,000 feet in July, and a pair near Kohima, Naga Hills, in May and July.

Sub-family—*Deudoriginæ.*

DEUDORIX EPIJARBAS, Moore.

Males exceedingly common in Manipur. Females appear to be rare and only five were taken. The dry-season-form is much smaller than the wet-season-form.

Two males and a female of the very distinct variety *diara,* Swinhoe, were taken at Imphal, Manipur, in October and November.

DEUDORIX HYPARGYRIA, Elwes.

A single male taken at Sebong, Manipur, in April agrees fairly well with Elwes' figure and description, it is however smaller, being only 1·48″ in expanse; the red colour is paler than shown on the figure and more restricted on the hindwing, the costal area as far as vein 5 being entirely fuscous. Underneath the wings are pure silvery with no tinge of brown near costa and outer margin, the markings on hindwing are similar but indistinct. The palpi are not entirely white, the terminal joint being fuscous.

Elwes placed his *hypargyria* in the genus *Rapala* but made no mention of it possessing any male secondary sexual characters. Evans for this reason in his "List of Butterflies" placed it under *Deudorix.*

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I have examined my specimen carefully. It is undoubtedly a male and has no secondary sexual characters, so that if my identification is correct *hypargyria* should be placed under *Deudorix*.

"?" DEUDORIX. sp. ?.

A single female taken near Suroi, Manipur, at about 4,000—5,000 feet in July may be new. It is very close to *D. epijarbas* ♀ but differs as follows :—

Upperside: darker with a purple gloss. Forewing: a rather indistinct reddish-brown patch in interspaces 2, 3 and 4 just entering 1.

Underside: Forewing: discocellular and discal bands very narrow. Hindwing: bands very narrow as on forewing; portion of discal band in interspace 7 in line with portions in interspaces 4, 5 and 6 and not shifted inwards; discocellular bands quite clear of discal band.

RAPALA TARA, De N.

Appears to be rare. Only a single male was obtained on the Irang River, Western Manipur Hills, in March.

RAPALA SPHINXNICEVILLEI, Swinhoe.

Three males taken at Nichuguard, Naga Hills, in October, March and April.

RAPALA SCINTILLA, De N.

Common at Imphal, Manipur.

RAPALA BUXARIA, De N.

I erroneously recorded in the J., B. N. H. S., Vol. XXI, p. 602, under the above name one of the forms of the variable *R. nissa*. I have however since taken numerous males and a female of true *buxaria* at Phesima, near Kohima, Naga Hills, during July and a few males below Kabru, Manipur, in May and June. Two females were also taken at the foot of the Naga Hills in October and November. The males of *R. buxaria* appear to fly somewhat higher than *R. nissa* and all my specimens were obtained at about 7,000 feet.

RAPALA ROSACEA, De N.

Seven males of a form taken on the Barak River, Western Manipur Hills, in March which agree very well with De Nicèville's description and figure except that the anal spots on hindwing, underside, are not marked with red but are golden or golden brown. They can be at once distinguished from *R. nissa* by the much paler colour of the sexual patch on upper hindwing and on the underside by the anal spots not having any trace of black. The sexual patch of modified scales on hindwing extends slightly along veins 6 and 7 and just into the base of interspace 6 which it does not do in *R. nissa*. Four of the specimens are strongly suffused with rosy pink on the underside and three are yellowish with scarcely any pink suffusion.

RAPALA PETOSIRIS, Hewitson.

Fairly common in Manipur at low elevations. A few specimens were also taken at Nichuguard, Naga Hills.

RAPALA SUFFUSA, Moore.

Common in Manipur. Many specimens taken at Sebong and on the Irang River, Western Manipur Hills.

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? RAPALA REFULGENS, De N.

Six males which I doubtfully identify as belonging to this species were taken at Sebong, Manipur, in April. They agree fairly well with De Nicèville's description but the colour of the upperside is more purple than in *L. eryx* with which De Nicèville compares his *refulgens*.

It does not appear to be a true *Rapala* as the secondary sexual patch on hindwing fills the base of interspace 6 as in *Virachola* and *Sinthusa* but does not extend into the cell as in those genera. The underside resembles a *Sinthusa* more than a *Rapala*.

VIRACHOLA ROSACEA, n. sp.

Male. *Upperside*: both wings dull purple glossed with pink. Hindwing: costal area pinky brown; sexual patch of modified scales pinky brown; anal lobe yellow brown sprinkled with a few black scales. *Underside*: rich dark vinous buff, all the markings very obscure. Forewing: discocellulars faintly marked with darker colour; a faint post-discal macular band of darker colour, parallel to the margin, visible in interspaces 1-3. Hindwing: discocellulars marked by two white lines, the space between them filled with darker colour. A post-discal macular band of darker colour edged on both sides with white and outwardly produced in space 5 and recurved along the dorsum; anal lobe black; a small black spot in interspaces 1 and 2 placed on an orange ground, the spot in interspace 1 irrorated with a few metallic blue scales; and lastly a white streak above the anal lobe. Tail black tipped with white. Cilia on termen concolorous with the ground colour below, tipped with white below anal spots of hindwing and becoming pure white along dorsum.

Antennæ: black ringed with white, apex of club red brown.

Expanse: ♂ ♂ 1·3″-1·44″.

On the upperside this species looks more like a *Rapala* than a *Virachola* and has the termen of forewing rounded and not straight but on the underside the macular band is in shape nearer to that of *Virachola* and the shape of the sexual patch on hindwing is similar.

VIRACHOLA ISOGRATES, Fab.

Males taken commonly at Imphal, Manipur.

VIRACHOLA PERSE, Hewitson.

Appears to be rare. A couple of males taken at Imphal, Manipur, in October and a female at Nichuguard, Naga Hills, in May.

VIRACHOLA DOHERTY, n. sp.

A single specimen of a male taken at Kirbari, Naga Hills, at 5,000—6,000 feet in September appears to be new and quite unlike anything I know.

Male. *Upperside*: both wings grey-blue, veins marked with fuscous. Forewing: costal area as far as upper edge of cell and apex broadly fuscous, this colour continued decreasingly along the termen ending almost in a point at the tornus. Hindwing: costal area as far as vein 6 fuscous; abdominal margin and interspace 1 covered with grey hairs; anal lobe small, fuscous and sprinkled with a few paler scales; a glandular patch of modified scales filling the base of interspace 6 and extending on either side into the cell and interspace 7.

Underside: both wings pale grey suffused with white except on the discocellulars, discal and subterminal bands. Forewing: discocellulars marked with grey bordered on both sides with white; a narrow grey, slightly

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curved almost straight, discal band from costa to vein 1 margined with white; an indistinct greyish submarginal band; a tuft of upturned grey hairs attached to the dorsum. Hindwing: discocellulars grey bordered with white; a discal band bordered with white as on forewing but consisting of short lumules and recurved along the inner margin; a subterminal narrow grey band bordered with white; anal lobe fuscous; a small fuscous spot above base of tail which is black tipped with white. Antennæ above fuscous indistinctly ringed with white; club tipped with yellowish; below similar but markings more distinct.

Expanse: ♂ 1·59″.

SINTHUSA NASAKA, Horsfield.

Six males and seven females taken in the Western Manipur Hills and at Sebong in January, April, July, October and December.

SINTHUSA CHANDRANA, Moore.

Three males taken at Saitu, Manipur Valley, in May and November. A male and female taken on the Irang River in January and April and two males at Sebong in January and April.

SINTHUSA VIRGO, Elwes.

Two specimens taken at Kirbari, Naga Hills, in June agree with De Nicèville's description and figure of *S. virgo*; they however have no secondary sexual marks and therefore if males cannot be assigned to the genus *Sinthusa* which has. If they are females they cannot, unless they are dimorphs, be *S. virgo* as they do not agree with Elwes' description.

In the De Nicèville collection there is one specimen labelled *S. virgo* which agrees with Elwes' description. There are also above it several specimens which agree with my two specimens and with De Nicèville's description and figure of *S. virgo* ♂. I have no note as to whether these specimens were marked ♂ ♂ or not, nor if any of them had secondary sexual characters but I think they had not, for I made the following note at the time: "Similar to what I have called *S. virgo* ♀". Referring to my two above mentioned specimens, if the ♀ referred to in De Nicèville's collection is really *S. virgo* then I am of the opinion that the wrong male has been assigned to it and that the next species described under the new genus *Pseudochliaria* as new will probably prove to be the true male of Elwes' *virgo*. But if De Nicèville's specimens are all females then they may possibly be a dimorphic ♀ form of *S. virgo*. It is however highly improbable that Mr. De Nicéville when describing his male should have done so from a female form lacking the secondary sexual characters of a *Sinthusa*, and possibly there was a male in his collection with secondary sexual characters which I overlooked; if this is so then his ♂ *virgo* with a similar female form will require a new name, and my *virgoides* will have to sink as a synonym of *S. virgo*, Elwes.

GENUS PSEUDOCHLIARIA, Nov.

Venation and secondary sexual patch of modified scales on upper hindwing similar to *Sinthusa* but differs from that genus in lacking on the underside of the forewing the tuft of upturned hairs on the dorsum and in the possession of a large patch of modified scales filling the basal third of the dorsal space below vein 1. Type *P. virgoides*, Mihi.

PSEUDOCHLIARIA VIRGOIDES, n. sp. (Pl. III, Fig. 26, ♂).

Male. *Upperside*: very like a dark specimen of ♀ *Chliaria kina*. Forewing: costa and termen broadly black; dorsum narrowly black; basal area dark

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grey; a small greyish-white discal patch. Hindwing: costal area brown; the remainder of the wing bluish-grey; veins slightly marked with darker colour; anal lobe yellow. Termen edged with black; sex mark of modified scales golden brown in some lights, dark grey in others. *Underside*: exactly similar to that of *S. virgo* ♂ as figured by De Nicéville Butterflies, India, Vol. III, Frontispiece Fig. 134. Cilia white. Female. *Upperside*: similar to the male but paler and discal patch on forewing much larger, as large as in ♀ *C. kina* which it closely resembles. *Underside*: similar to the male.

Expanse: ♂ 1·25″; ♂♂ 1·34″.

The underside of this species and of *S. virgo* is extraordinarily like *C. kina*.

Two females taken at Jakama, Naga Hills, 6,000 feet, at the end of June, and a male at the same place at the beginning of that month.

Arrhenothrix penicillegra, De N.

Four males and a female of the dry-season-form taken at Sebong and on the Lengba River, Manipur, in March and April, and three wet-season males in August. The dry-season males have the blue of a brighter shade and rather more extensive than the wet-season-form.

Camena cotoides, n. sp. (Pl. IV., Fig. 38, ♂).

Very like *C. cotys* but differs as follows:—

Male. *Upperside*: blue colour brighter and more metallic extending in interspaces land 2 of forewing right up to the termen; area below the sex mark on hindwing concolorous with the rest of the wing and not pale grey. *Underside*: Forewing: dorsal tuft of hairs brown and not black; submarginal line on both wings not so continuous and straight but broken up into lunules; a raw of whitish lunules between the submarginal dark line and the termen; anal area of hindwing more densely irrorated with bluish-grey scales.

Expanse: ♂ 1·5″.

A single male taken near Sebong, Manipur, in February.

Maneca bhotea, Moore.

A male and three females taken on the top of Kabru Peak, Manipur, 8,400 feet, in June and July and two males on Suroifui, 8,000-9,000 feet, in June.

I believe this species has not been previously recorded east of Sikkim.

Ops melastigna, De N.

A single female obtained at Sebong, Manipur, in April.

Ops œta, De N.

A single female obtained at Sebong in February.

Tajuria ister, Hewitson.

Thirteen males and two females of the dry-season-form taken at Imphal in March and April and a male in June; a male of the wet-season-form taken in July and two more in August at the same place and four males and three females at Imphal and Sebong in November.

The males and females of this species are very like the female of *C. cleobis* on the upperside but can be readily distinguished on the underside by the postdiscal band on forewing being placed closer to the termen.

The male only differs from the female in having the blue on upper forewing slightly restricted in interspace 3. The seasonal forms differ a good

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deal; the wet-season-forms being darker and the blue on the upperside of forewing more restricted, agreeing in this respect with the seasonal forms of *C. cleobis*.

There are two males and two females of this species in the De Nicéville collection labelled *ister*. Three of these have the yellow area round the anal spots on underside of hindwing well developed and one has it rather restricted as is the case of all my specimens from Manipur.

If the insects identified by De Niceville as *ister* are really Hewitson's species then it should come under the genus *Tajuria* as the male has no secondary sexual characters.

TAJURIA SEBONGA, n. sp. (Pl. IV, Fig. 40, ♂).

Male. Rather like *T. thyia*. *Upperside*: the blue area is rather paler and brighter extending on the forewing to the tornus. *Underside*: bands very similar to *T. thyia* but the ground colour is paler and greyer; anal spots much smaller and the yellow round them very restricted and hardly visible. Hindwing with either one or two tails.

Expanse: ♂♂ 1·3″—1·4″.

The type taken at Sebong in January has only one tail; another specimen taken at the same place in February and five males in March also have only one tail; of thirteen males taken at the same place in April ten have only one tail; two damaged specimens show an inner tail broken off and one fresh specimen shows two tails. Many of the one tailed males are in perfect condition and I am quite sure that the inner tail is really wanting and not broken off as I have examined them carefully through a microscope and can find no signs of a broken off tail.

TAJURIA LONGINUS, Fabr.

A male taken at Imphal, Manipur, in March, and three more in August.

TAJURIA NILA, Swinhoe.

A single male taken at Sebong, in April, which agrees exactly with two males in the De Nicéville collection.

TAJURIA BIÆUS, Hewitson.

Two dry-season females taken on Kabru, Manipur, 8,400 feet, in June and two males and a female of the wet-season-form at the same place in July. A female of the dry-season-form was also taken at Jakama, Naga Hills, 7,000-8,000 feet, in October.

TAJURIA THYIA, De N.

A male taken near Imphal, Manipur, 3,000 feet, in July, agrees exactly with Khasia Hill specimens.

TAJURIA THYDIA, n. sp. (Pl. IV, Fig. 47, ♂).

Male and female. Upperside: very like *T. thyia*, blue area slightly more extensive. *Underside*: very similar to *T. diæus*.

Expanse: ♂ 1·48″; ♀ 1·56″.

A male and female taken on Kabru, Manipur, 8,400 feet, in August.

TAJURIA MEGISTIA, Hewitson.

A single male was obtained on the Irang River, Western Manipur Hills, in October. It appears to be very rare in Manipur.

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TAJURIA YAJNA ISTROIDEA, Doherty.

A single male taken at Sebong, in April.

TAJURIA MACULATUS, Hewitson.

Males common in Manipur and numerous specimens were taken of both seasonal forms which differ from one another so greatly. A single female was taken at Nichuguard, Naga Hills, in May.

TAJURIA JANGALA RAVATA, Moore.

Common at low elevations in Manipur.

TAJURIA JALINDRA INDRA, Moore.

Males common in Manipur and numerous specimens were taken on the Range Hills near Imphal at 3,000 feet, throughout the year. The female appears to be rare and only one was obtained in March.

ARAOTES LAPITHIS, Moore.

A single male taken at Nichuguard, Naga Hills, in May, and another at Sebong, Manipur, in October.

SUASA LISIDES, Hewitson.

Eight males and a female of this rare and beautiful species were obtained at Sebong, Manipur, in March, July, October and November.

NEOCHERITRA FABRONIA, Hewitson (Pl. II, Fig. 17, 18, ♂, ♀).

A male and female of this rare form were obtained near Saitu at the northern end of the Manipur Valley at about 4,000—5,000 feet in May and June; a female near Sebong, in November, and a female at Phiphima, Naga Hills, in October at 4,000 feet.

I have figured both sexes as this form is so little known to collectors in India.

CHERITRELLA TRUNCIPENNIS, De N.

Numerous males of this interesting species were obtained in the Naga Hills at about 7,000 feet during July and August. The females appear to be rare and only four were obtained.

BINDAHARA PHOCIDES, Fabr.

A fair number of males and three females were obtained at Sebong and in the Western Manipur Hills at low elevations throughout the year.

YASODA TRIPUNCTATA, Hewitson.

Not uncommon in Manipur. The seasonal forms vary considerably.

CHARANA MANDARINUS, Hewitson.

A single female taken on the Longba River, Western Manipur Hills, in March and six males at Sebong, in April.

LEHERA ERYX, L.

Not uncommon in the Manipur Valley. Numerous males and eleven females were taken near Imphal from March to November. The dry-season-form is somewhat smaller and many specimens have the underside tinged

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with yellow and appear to be intermediate between the forms with pure green underside and *L. skinneri*.

LEHERA SKINNERI, W. M. and De N.

A single male of this form was taken near Imphal, Manipur, in December. I think it will prove to be an extreme dry-season-form of *L. eryx*.

CATOPŒCILMA ELEGANS, Druce.

Very common on the Range Hills near Imphal, Manipur, at about 3,000 feet. The dry-season-form of the female is much paler and has the blue more extensive than the wet-season female. The seasonal males do not differ appreciably.

CATAPŒCILMA DELICATUM, De N.

A single female taken at Nichuguard, Naga Hills, in April. I believe this species has hitherto only been recorded from Sikkim.

HORAGA MOULMEIMA, Moore.

Common in Manipur. Rare in the Naga Hills where only a male and four females were obtained at the foot of the Hills near Nichuguard. The seasonal forms vary greatly. The dry-season-form has the blue much paler and more extensive; on the underside the colour on outer half is pale silvery-brown instead of yellow-brown and the white discal patch on the forewing quite reaches the costa in the female and almost reaches it in the male.

HORAGA VIOLA, Moore.

A male and two females taken at Imphal and Sebong, Manipur, in July and August appear to be referable to this species but I have no specimens from other localities with which to compare them.

Family—HESPERIIDÆ.

Sub-family—*Hesperiinæ*.

ORTHOPÆTUS LALITA, Doherty.

A male taken at Sebong, Manipur, in March and another in April.

CAPILLA ZENNARA, Moore.

A male taken at Nichuguard, Naga Hills, in November. Two males at Sebong, Manipur, in July and another in October.

ACHALARUS BIFASCIATA LILIANA, Atkinson.

Numerous males and two females obtained at Sebong and at Kanjupkhul, from the foot of the hills up to 6,000 feet, from March to June and several males and two females at Phesima and Kirbari, Naga Hills, during May and June. The female appears to be very rare.

ACHALARUS ABORICA, n. sp. (Pl. II., Fig. 16, ♂).

Male differs from *A. liliana* on the upperside in being much darker. Forewing: three subapical white spots and not five; discal band yellow and not creamy white. Cilia on hindwing with the pale portions darker; on forewing uniform dark brown and not chequered with paler scales except in interspace 1,

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where their area few paler scales. *Underside:* darker; discal band yellow and not creamy, cilia as on upperside.

Expanse: ♂♂ 2·04″—2·12″.

Two males taken by Captain Porter near Pasighat, Abor Hills, in June and July and kindly presented to me.

The yellow discal band at once distinguishes this form from *A. liliana*.

Celænorrhinus clitus, De N.

I previously recorded this species from the Naga Hills under the name of *aspersa* from which species, according to Col. Swinhoe, it is quite distinct.

It is decidedly a rare species and I have only managed to secure four more males at Kirbari in June and July.

Celænorrhinus pulomaya, Moore.

According to Elwes' and Edwards' key to the genus "Celænorrhinus" this species is said to have the "shaft of antennæ *white* in front only near base of the club."

Swinhoe in "Lepidoptera Indica" states "Antennæ: both sexes with an *ochreous-white* short streak below the club." There are two forms in the Naga Hills closely resembling one another but which I believe to be quite distinct. One has the short streak below the club *pure white* and the other *ochreous-yellow*. Numerous specimens of both forms were obtained in the Naga Hills and the differences between them appear to be constant.

Following Elwes' and Edwards' I take the white banded form to be *C. pulomaya* and I propose separating the yellow banded form under the name *C. pila*.

Celænorrhinus pila, n. sp.

Closely allied to *C. pulomaya* but differs as follows:—

(*a*) Base of club of antennæ banded with yellow and not white.
(*b*) Sub-basal spot and the lower of the two discal spots in interspace 1, smaller as a rule.
(*c*) Orange spots on upper hindwing darker.
(*d*) Orange cilia not so broadly chequered with black at the veins.
(*e*) Forewing more pointed and termen straighter.
(*f*) *Underside*: Orange spots darker.

Expanse: ♂♂ 1·7″-1·92″; ♀♀ 1·86″-2.03.″

Taken commonly at Kirbari and Takabama, Naga Hills, in August.

Celænorrhinus pyrrha, De N.

Both sexes of this species sometimes have and sometimes lack a sub-basal pale spot in interspace 1 of forewing upperside; it can however also be separated from other closely allied forms by the presence of the two additional pale spots in interspace 1 of forewing underside.

Two females taken at Kohima and Kirbari, Naga Hills, in August and September; two pairs at Sebong, Manipur, in April, May and October, and two pairs at Saitu in October.

Celænorrhinus plagifera, De N.

Six pairs taken at Kirbari, Naga Hills, in July, August and October at 6,000-7,000 feet. This species is quite distinct from *C. pyrrha* and *C. patula*; from the former it can be distinguished by the absence of the two submarginal spots in interspace 1 of forewing underside, between the two spots of discal band and termen; and from the latter in having the shaft of the antennæ in both sexes black speckled with white and not pure white.

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Celænorrhinus, sp. ?

A single *male* taken at Saitu, Manipur, 4,000 feet, in September differs from its nearest ally *C. patula* as follows:—

Antennæ: inner face of club white, outer face of club black except at the base where it is white; shaft speckled with black and white.

Upperside: Forewing: discal band consisting of only three spots, much narrower than in *C. patula*. Hindwing: no spots on disc, only a submarginal row, paler than in *C. patula*.

Underside: Hindwing: spots paler and indistinct on disc. Cilia paler yellow, broadly chequered with black.

This may possibly be *C. sumitra*, Moore, about which there appears to be some doubt. Major W. H. Evans who examined Moore's types informed me that it had no discal orange spots on upper hindwing but only a row of large marginal spots, agreeing with my specimen in this respect.

Celænorrhinus patula, De N.

Numerous males and five females were taken at Kirbari and at Takabama, Naga Hills, at 6,000-7,000 feet from July to September. It can be at once distinguished from all other closely allied forms except *C. pero* by having the shaft of the antennæ in both sexes anteriorly white.

Celænorrhinus pero, De N.

Apparently very rare. A single female only was obtained at Jakama, Naga Hills, 6,000 ft. in September.

Celænorrhinus leucocera, Koll.

A few specimens of both sexes taken at low elevations in Manipur in March, April, May and November.

Celænorrhinus maculicornis, El. and Ed.

Three males taken at Sebong, Manipur, in October and a female at Saitu in May. Seven males and a female taken at Phesima, Jakama and Kirbari in the Naga Hills at 6,000 feet from July to October. This form is very closely allied to *C. munda*.

Celænorrhinus chamunda, Moore.

Very common at Sebong, Manipur, where numerous specimens of both sexes were taken in March, April and June.

Celænorrhinus nigricans, De N.

A male taken on the Barak River, Western Manipur Hills, in March and a female at Saitu in September.

Celænorrhinus aurivittata, Moore.

Taken very commonly at low elevations in Manipur, not so common in Naga Hills where one specimen was taken as high as 6,000 ft.

Celænorrhinus affinis, El. and Ed.

Two pairs taken in Manipur at low elevations in April, May and November, and a male at Kirbari, Naga Hills, 6,000 feet in November.

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COLADENIA INDRANI UPOSATHRA, Furhst.

A male on the Irang River, Manipur, in February and another at Sebong in April. Apparently rare.

COLADENIA FATIH, Kollar.

Not very common in the Naga Hills where it has been taken at about 6,000-7,000 feet. A few specimens also taken in Manipur at 3,000-4,000 feet. This species appears to fly at much higher elevations than *C. dan* which I have only taken at the foot of the hills where it is common.

COLADENIA AGNI, De N.

Three males and a female taken at Sebong in March and April and a male on the Cachar Road, Manipur, in March.

COLADENIA AGNIOIDES, El. and Ed.

Two males of this very rare form were taken at Sebong in April and June and a male at Nichuguarda, Naga Hills, in April. Although superficially somewhat like *C. agni* ; it can easily be distinguished from that species by the characters mentioned by Elwes and Edwards and by the presence of two conjoined diffuse pale spots in interspace 1 on the underside of the forewing exterior to the spot of the discal series in that interspace.

COLADENIA BUCHANANII, De N.

A single male taken at Sebong in April. This species has I believe been hitherto only known by a single female taken by Mr. A. M. Buchanan in the Ruby mine district, Upper Burma.

TAPENA THWAITESI, Moore.

Two males taken at Sebong in March and April.

CTENOPTILUM VASAVA, Moore.

A large series of males taken on the Irang River, Western Manipur Hills, in March, and a single male at Nichuguard, Naga Hills, in June.

CTENOPTILUM MULTIGUTTATA, De N.

A male taken at Sebong in February and five more at the same place in March.

? CAPRONA KUKI, Bingham.

A pair taken at Sebong and Imphal, Manipur, in March may possibly belong to this species. The upperside is much darker than in *C. alida*. The type specimen now in the British Museum was taken by me in the Lushai Hills.

CAPRONA ALIDA, De N.

Four males taken at Imphal, Manipur, in March and April, agree exactly with specimens I have from the Shan States, Burma.

CAPRONA SYRICHTHUS, Felder.

Not uncommon at Imphal and Sebong, Manipur, from May to August.

CAPRONA ELWESII, Watson.

Two males taken at Sebong, Manipur, in June.

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They quite agree with Watson's description and differ from true *syrichthus* exactly in the way he states. It appears to be a good species in spite of the genitalia being the same according to Elwes.

TAGIADES ATTICUS KHASIANA, Moore.

Not uncommon throughout the year in Manipur at low elevations.

TAGIADES ALICA MEETANA, Moore.

Not uncommon throughout the year in Manipur and the Naga Hills throughout the year.

TAGIADES GANA, Moore.

A single male taken at Gaspani, Naga Hills, 1,700 feet, in October.

TAGIADES LITIGIOSA, Moschler.

Very common both in the Naga Hills and in Manipur.

TAGIADES MENAKA, Moore.

Common in Manipur.

TAGIADES PTERIA DEALBATA, Distant.

Five males taken at Sebong in March and another in April.

TAGIADES PRALAYA, Moore.

Six males and females taken at low elevations in Manipur in April, October and November. A pair taken at Gaspani in the Naga Hills near Nichuguard in June and October.

SATARUPA GOPALA, Moore.

A single male which agrees very well with specimens from the Khasi Hills was taken at Nichuguard, Naga Hills, in April.

SATARUPA SPLENDENS, n. sp.

Male. *Upperside*: very similar to *S. gopala* but differs as follows :—

Upperside: Forewing: spot in cell larger, lower edge as long as upper, distinctly contracted at the middle; spot in interspace 5 minute; spot in interspace 2 broader than long; spots in interspace 1 smaller and round, the upper one minute. Hindwing: subterminal row of spots placed further inwards; terminal black area broader, much darker, and not divided along the veins by traces of bluish-white. *Underside:* Forewing differs in the same way as does the upperside but in addition has a well defined bluish-grey subterminal diffuse band from costa to dorsum, its inner edge almost touching the discal spots in spaces 1, 2 and 3 and enclosing the spots in spaces 4 and 5. This pale band does not develop into two well defined spots in interspace 1 which is such a well marked feature in *S. gopala*. Hindwing: costal interspace completely white, the two black spots in interspace 7 as in *S. gopala*; terminal area darker and broader as on upperside.

The female is very similar to the male but all the white spots on forewing are somewhat larger; the spot in cell quite square and not pinched in at the centre; the spot in interspace 2 almost square if anything longer than broad; the lower spot in interspace 1 elongated and not round. The male is also larger than *S. gopala*; forewing more pointed at the apex and hindwing outwardly produced from vein 2 to 4, giving the wing a much squarer appearance.

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Expanse: ♂ 2·8″; ♀ 3·2″.

A single male taken at Kirbari, Naga Hills, 6,000 feet in July, and a female at Jakama, Naga Hills, in September.

Satarupa zulla, n. sp.

Very similar *S. splendens*, Mihi, with which it agrees in size and shape of hindwing but the forewing agrees better in shape with *S. gopala*. It differs from *S. gopala* from Sikkim and the Khasia Hills in my collection as follows:—

Male. *Upperside:* Forewing: spot in cell round and minute; spot in interspace 5 minute or wanting; spot in interspace 2 larger, as broad as long; spots in interspace 1 much larger, longer than spot in interspace 2. Hindwing: subterminal row of spots more inwardly placed and terminal area darker as in *S. splendens*, Mihi. *Underside:* Forewing: similar to upperside but with a pale bluish-grey diffuse band as in *S. splendens*, Mihi. Hindwing: costal interspace completely white, only one spot in interspace 7, the inner one wanting. Subterminal spots and terminal dark area as in *S. splendens*, Mihi.

Expanse: ♂ ♂ 2·78″—2·9″.

A male taken at Kirbari, Naga Hills, 6,000 feet, in July, and two more at the same place in September 1914.

Satarupa bhagava, Moore.

Watson recorded this species as common in the Upper Chindwin and in the hills up to 1,500 feet, but at Sebong, Manipur, which is not so very far from where Watson collected I only secured a single male in March.

Satarupa narada, Moore.

Four males taken at Sebong, Imphal, and on the Irang River, Manipur, in March and April, and a female at Saitu in September.

Satarupa diversa, Leech.

This species differs from *S. narada* according to Elwes' key in having the spot in interspace "1 a" of forewing subequal in width to that in "2"; in *S. narada* it is nearly twice as wide.

There are two forms from Manipur and the Naga Hills which agree with *S. diversa* in this respect but which differ from one another as follows:—

Form (1) of which I only took a single female on the Irang River, Manipur, in March and which agrees with three females I have from the Khasia Hills has the hairs of the breast white or ochreous-white and body on upperside white. This appears to be true *S. diversa*.

Form (2) of which I took a pair at Kirbari, Naga Hills, 6,000 feet, in July and August, differs from form (1) in having the hairs of the breast deep yellow and the upperside of the body brown. The 2nd form is very close to *S. phisara* but differs from that species in having a well formed white spot in space 1 of forewing subequal in width to that in space 2 and all the markings are pure white and not cream colour. The male has indications of the dark spot on the discal white band on hindwing at the extreme edge of the cell as in *phisara*. It may possibly be only an aberration of *phisara* which however in the Naga Hills and Manipur flies at much lower elevations.

Satarupa sambara, Moore.

A male taken at Sebong in April; 6 males in the Western Manipur Hills in March and April; a male at Nichuguard, Naga Hills, in May and another at Kirbari, 6,000 feet, in June. It does not appear to be common in the Naga Hills and Manipur.

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This form may be referable to the race *kirmana*, Swinhoe, from Burma, which I only know by Swinhoe's figure to which it is very similar.

ODINA DECORATUS, Hewitson.

A male of this rare species was taken on the Irang River, Manipur, in March, and another at Sebong in April.

DARPA HANRIA, Moore.

A male taken on the Irang River, Manipur, in March, and another at Kohima, Naga Hill, in September.

Sub-family—*Pamphilinæ.*

BARACUS SEPTENTRIONUM, W. M. and De N.

Not uncommon in Manipur at 4,000-8,000 feet from April to September.

SANCUS PULLIGO SUBFASCIATUS, Moore.

Not common in Manipur.

ASTICTOPTERUS OLIVASCENS, Moore.

Very common in Manipur. Most of the specimens were obtained in the rains.

ASTICTOPTERUS HENRICI KADA, Swinhoe.

Common in Manipur, most of the specimens were taken in the cold weather. I am not sure whether this form will not prove to be merely the dry-season-form of *A. olivascens.*

KORUTHAIALOS RUBECCLA, Plötz.

Common at Sebong, Manipur, from November to April; two specimens were taken at Nichuguard, Naga Hills, in May and October. The width of the red band is very variable; the two specimens from Nichuguard and two males and a female taken at Sebong in October and April have this band merely indicated and one specimen might easily be mistaken for *K. butleri.*

KORNTHAIALOS BUTLERI, W. M. and De N.

Four males and two females taken at Nichuguard, Naga Hills, from October to March and two males and a female in the Western Manipur Hills in October and January, it does not appear to be common.

KORUTHAIALOS, sp. ?

Three males taken on the Irang River, Manipur, in February and a male at Nichuguard in May differ from *K. butleri* in being larger and having the apex of forewing more pointed.

SUADA SWERGA, De N.

Common at Sebong during the cold weather.

SUASTUS GREMIUS, Fabr.

Common at Imphal. The cold weather form lacks the spot in the cell of forewing on both sides and the dark spots on hindwing below are often obsolescent.

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SUASTUS ADITUS, Moore.

A single male taken at Nichuguard, Naga Hills, in November and five males at Sebong and in the Western Manipur Hills in March and November.

TARACTROCERA ATROPUNCTATA, Watson.

A male taken at Sebong in July and a female during the same month near Suroi Village, Manipur.

AMPITTIA MARO, Fabr.

Males common in the Manipur Valley. A few also taken at Sebong. The females appear to be much rarer and only seven were obtained.

AMPITTIA MAROIDES, De N.

Five males taken at Sebong in April, July and November. This species has not previously been recorded north of Tenasserim.

IAMBRIX TYTLERI, Evans.

A female taken at Kirbari, Naga Hills, in July and two males at the same place in September have recently been described by Major W. H. Evans under the above name.

Expanse: ♂ 1·18″; ♀. 1·35″.

TAMBRIX ? sp. ?

A single female taken on the Irang River, Manipur, is very close to *I. tytleri* but differs on the upperside in having the two spots in the cell of forewing quite separate and the lower spot not inwardly produced beyond the inner edge of the spot in interspace 2; the outer edge of spot in interspace 2 in line with the spot above it and not outwardly produced; an additional spot in interspace 3 near the base. *Underside*: Forewing: differs as on upperside. Hindwing: no spot in cell, otherwise similar.

Expanse: ♀ 1·05″.

ÆROMACHUS, sp. ?

Four males of a species very close to *Æ. stigmata* taken at the northern end of the Manipur Valley in June and another in the Western Manipur Hills in March. The markings on the underside are very similar, but the spot in the cell is rather darker. The forewing on the upperside completely lacks the sexual brand.

ÆROMACHUS STIGMATA, Moore.

Not common in Manipur, four males and three females taken at the northern end of the Manipur Valley and a male at Sebong. Two males taken at Kirbari, Naga Hills, where it is more plentiful than in Manipur, have the discal brand very indistinct and the postmedian row of white spots on forewing very distinct, on the underside the dark spot in the cell is hardly indicated.

ÆROMACHUS DISCRETA, Plötz.

Two males and a female, which agree with specimens from the Khasi Hills, were taken at the northern end of the Manipur Valley in May and July.

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ÆROMACHUS JHORA, De N.

Many males and four females taken in the Imphal Valley from March to July. A single male taken at Nichuguard in May.

ÆROMACHUS KALI, De N.

The males of this distinct species are not uncommon in the Naga Hills but the female appears to be rare and I only managed to secure one at Jakama in July.

SEBASTONYMA DOLOPIA, Hewitson.

A fair number of males taken at Sebong, Manipur, from November to July.

PEDESTES PANDITA, De N.

Several males taken at Sebong, Manipur, in April.

HYAROTIS ADRASTUS, Cramer.

Not common, males taken in both the Eastern and Western Manipur Hills at low elevations from January to June. The female was not taken.

ARNETTA ATKINSONI, Moore.

Common in Manipur. Dry-season-froms taken form February and wet-season-forms in May and June.

ITYS MICROSTICTUM, W. M. and De N.

A single male taken in the Western Manipur Hills in January and another at Nichuguard, Naga Hills, in March.

ZOGRAPHETUS SATWA, De N.

A male at Nichuguard in March and two females at Sebong in February and March.

ZOGRAPHETUS FLAVIPENNIS, De N.

Two males at Sebong in April.

SCOBURA CEPHALA, Hewitson.

Four specimens taken at the foot of the Naga Hills from August to December. Six specimens on the Irang River, Manipur, in December and several specimens at Sebong in April, June and November. Six specimens of a form taken at Sebong from February to March differ from the above in having all the spots smaller; only one spot at the lower edge of the cell and the apical spots obsolescent, two specimens having only two and four only one, one of the latter also has only one spot faintly indicated on upper hindwing. They may be extreme dry-season-forms.

? SCOBURA MARTINI, El. and Ed.

Three males of a form close to *S. cephala* were taken at Nichuguard in May and a male and female in the Western Manipur Hills in March which I am unable to identify with certainty but which best agree with the description and figure of *S. martini*. Two of these specimens have the pale spot on upper hindwing merely indicated.

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SCOBURA CEPHALOIDES, De N.

Three males and a female taken at Nichuguard, Naga Hills, in March, April and June, twelve males and two females at Sebong in April and June, and a male in the Western Manipur Hills in July.

PUDICITIA PHOLUS, De N.

Many males and six females of this rare and interesting form were taken at Kirbari, Naga Hills, 6,000 feet, in August and September 1913. In other years I took it very sparingly.

GANGARA THYRSIS, Fabr.

A male taken at Sebong in April and a female at the same place in November. A male was also obtained at Nichuguard, Naga Hills, in October.

MATAPA ARIA, Moore.

Common in Manipur.

MATAPA PURPURASCENS, El. and Ed.

Two pairs taken at Sebong, Manipur, in April and October, and a male at Nichuguard, Naga Hills, in March.

MATAPA DRUNA, Moore.

A single male taken at Nichuguard in October.

MATAPA SASIVARNA, Moore.

A pair taken at Sebong in April and November and a female at Nichuguard in March.

TAMELA (=KERANA) DIOCLES, Moore.

Common both in Manipur and in the Naga Hills.

WATSONIELLA SWINHOEI, El. and Ed.

Males common in the Naga Hills, 6,000—7,000 feet, during July and August. Only a single female was obtained.

PIRDANA HYELA RUDOLPHII, El. and De N.

A single male taken at Sebong in April.

PLASTINGIA MARGHERITA, De N.

A male taken on the Irang River, Manipur, in April.

PLASTINGIA NOEMI, De N.

Five males taken at Sebong and on the Lengba River, Western Manipur Hills, in March and July.

PLASTINGIA NAGA, De N.

Three males taken at Sebong in November.

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PLASTINGIA TYTLERI, Evans.

A single specimen recently described by Major W. H. Evans under the above name was taken at Sebong in March.

LOTONGUS SARALA, De N.

A male and female of this very rare species were obtained at Gaspani, Naga Hills, 1,700 feet, in October.

PITHANRIA MURDAVA, Moore.

Males common in Manipur in April. The female was not obtained.

PITHAURIA STRAMINEIPENNIS, W. M. and De N.

Males taken commonly in the Western Manipur Hills in March and April. A single female was obtained at Sebong in April.

PITHAURIOPSIS MARSENA, Hewitson.

Eight males of this form better known under the name *Pithauria aitchisonii*, W. M. & De N., were obtained on the Barak River, Western Manipur Hills, in March.

CUPITHA PURREA, Moore.

A fair series of males and two females were obtained at Sebong in March and April and again in October and November. The autumn form on the upperside has the yellow markings more restricted than the spring form.

AUGIADES SIVA, Moore.

Both sexes were taken in fair numbers in the hills near Imphal, Manipur, 4,000—6,000 feet, during May and June.

TELICOTA PALMARUM, Moore.

A single specimen taken near Sebong, Manipur, in February.

TELICOTA GOLA, Moore.

This species does not appear to be at all common in Manipur. A pair obtained at Sebong in March and three more males in October and November.

HALPE ZEMA, Hewitson.

Numerous specimens taken at the foot of the Naga Hills and at low elevations in Manipur.

HALPE CERATA, Hewitson.

Not uncommon in Manipur and the Naga Hills at low elevations.

HALPE KNYVETTI, El. and Ed.

Fifteen males taken near Kohima, Naga Hills, appear to be referable to this species. Only one specimen however agrees with Elwes' key in having a pale point below the cell spot in the forewing on both sides of the wing; five specimens have this pale point on the underside of the wing but lack it on the upperside and the remainder lack it on both sides.

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HALPE KUMARA, De Nicéville.

Numerous males and eight females taken at Kohima and Kirbari, Naga Hills, during August and September and a few specimens at Kabru, Manipur, 8,000 feet, in July and August. Two specimens differ from the remainder in having a pale point next the lower edge of the cell spot on both sides of the wing.

HALPE SIKKIMA, Moore.

Four males and a female taken at the foot of the Naga Hills and two males in Manipur, all at low elevations.

HALPE HONOLEA, Hewitson.

Very common in both Manipur and the Naga Hills. The females appear to be rare. Some of the specimens cannot be separated with certainty by the cilia from *H. sikkima* and of the numerous unset specimens taken, some will certainly prove to belong to that species.

HALPE BURMANA, Swinhoe.

A single male taken at Sebong, Manipur, appears to be referable to this species.

HALPE FUSCA, Elwes.

Two males taken at Nichuguard, Naga Hills, in June and three more at Kanglatombi and Kanjupkhul, Manipur, in the same month.

HALPE DEBITIS, El. and Ed.

Fourteen males of a form identified by Major W. H. Evans as this species were obtained at Kohima and Kirbari, Naga Hills, 6,000—7,000 feet, during August; a male at Kabru, Manipur, in June and another at Sebong in May. This form certainly agrees with Elwes' description and figure except that the cilia of forewing is chequered and not pale grey but all the specimens before me have a pale band below the apiculus of the club and therefore according to his key should be near *H. hyrie* and may possibly be that species.

HALPE SEPARATA, Moore.

There are two closely allied forms occurring in Manipur. The first form identified by Major W. H. Evans as *H. separata* has the cilia conspicuously chequered; the pale portions being pure white; of this form numerous males and four females were obtained in the Naga Hills at 6,000—7,000 feet in July and August and a male and two females on Kabru peak, Manipur, during the same months. The second form has the spots on forewing smaller especially so in the male and the spot interspace 3 is often wanting. On the underside the ground colour is rather more yellow and the cilia is not conspicuously chequered, the pale portions being dark grey. Four males and eleven females of this form were obtained on Kabru peak in July. There is also a single male of this form in my collection from Sikkim given to me by Mr. E Ollenbach.

ITON SEMAMORA, Moore.

Not uncommon in Manipur and the Naga Hills at low elevations. A single male was also taken at 6,000 feet in the Naga Hills in the month of August.

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BAORIS FARRI, Moore.

This species better known as "*Parnara oceia*, Hewit.," occurs commonly, both in the Naga Hills and in Manipur at low elevations.

PARNARA AUROCILIATA, El. and Ed.

Six males and a female of this very distinct species were taken at Kirbari and Kohina, Naga Hills, in July, August and September, and three males on Kabru peak in June and September at between 6,000—8,000 feet.

PARNARA DISCRETA, El. and Ed.

Not uncommon in both Manipur and the Naga Hills from the foot of the hills up to 6,000 feet.

PARNARA TULSI, De N.

Seven males and two females of this distinct form were taken on the low range hills near Imphal, Manipur, and at Sebong from March to November; and a male at Gaspani, Naga Hills, 1,700 feet, in November.

ISMENE MAHINTHA, Moore.

A fair series of males and females taken near Sebong, Manipur, during nearly every month. It is however by no means common.

ISMENE ATAPHUS, Watson.

Four males taken at low elevations in Manipur in April, October and December and a male at Nichuguard, Naga Hills, in June. It does not appear to be at all common.

ISMENE HARISA, Moore.

Apparently rare in Manipur where only a single male was obtained on the Cachar Road in September.

HASORA CHUZA, Hewitson.

About twenty males and a single female of this beautiful species were obtained at the foot of the Manipur Hills near Sebong, and at Nichuguard, Naga Hills, in October and November and again from March to May.

HASORA ANURA, De N.

A large number of males and females of this rather rare butterfly were obtained at Kirbari and Jakama, Naga Hills, at about 6,000-7,000 feet and at Suroifui, Manipur, at about the same elevation from July to October. A single male was also taken at Imphal, 3,000 feet, in June. It flies at a much higher altitude than *H. badra*.

HASORA BADRA, Moore.

A fair number of males and four females at Nichuguard, Naga Hills, and at Imphal and Sebong, Manipur, in January, May, July, October and November.

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LIST OF THE BIRDS OF BALUCHISTAN.

PART II.

BY

LT.-COL. H. DELAMÉ RADCLIFFE, F.Z.S.

(Royal Welch Fusiliers).

FAMILY: PICIDÆ.

100. *Gecinus gorii.*—Hargitt's Scaly-bellied Green Woodpecker. [947.]

I several times observed this species at Ziarat at 8,000 feet and upwards, and think it must certainly breed there as I saw the birds in June and July. Several specimens were shot in 1913, I believe, by Capt. Meinertzhagen, 7th Royal Fusiliers. There are 3 specimens in the MacMahon Museum at Quetta.

101. *Dendrocopus sindianus.*—The Sind Pied Woodpecker. [963]

I only once observed this species in Baluchistan, and that was in May 1913, when I saw one of these birds on the trunk of a tree in the Gloucester Road, Quetta. Marshall states that it is common at Shelabagh at the mouth of the Khojak Tunnel, and on the Khwaja Amran range.

Note.—I believe it will be found that one of the species of Pigmy Woodpecker, "*Iyngipicus*", frequents the Juniper forest in Baluchistan. I saw near Ziarat at about 9,000 feet several holes in the trunks of Juniper trees, which I think could not have been made by anything else than a very small species of woodpecker, and in my opinion by one of the "*Iyngipici.*"

102. *Iynx forquilla.*—The Common Wryneck. [1003.]

I have not personally observed this species more than a couple of times in spring, evidently during migration, but Marshall states that this species is a constant visitor on migration in April. There are two specimens in the MacMahon Museum at Quetta.

CORACIADÆ.

103. *Coracias garrula.*—The European Roller. [1024.]

Appears in the Quetta Valley early in May, but none seem to stop to breed there, and they all appear to pass on to the higher valleys, returning again to the Quetta Valley, after breeding towards end of July. I saw a good many in June and July in the valleys between Kuch and Ziarat and I think it undoubtedly breeds there. This species leaves the Quetta Valley for warmer regions in October. I shot a specimen of this species on the 6th August 1913 in the Galbraith Spinney near Quetta. It was evidently a bird of the year.

104. *Coracias indica.*—The Indian Roller. [1022.]

I have not personally observed this species in Baluchistan, but it undoubtedly occurs there. On page 104 of Vol. III Blanford says that it is found sparingly throughout Baluchistan.

MEROPIDÆ.

105. *Merops viridis.*—The Common Indian Bee-Eater. [1026.]

I saw small parties of this species in my garden in Quetta in November 1911, and again in November 1912. They looked unhappy and as if suffering from the cold, and must have been migrating. I never saw this species

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during the summer or indeed at any other time, except as mentioned above. It was very remarkable that they should have been then so late in the year, but I am absolutely certain of the identity of the species, as on each occasion they were there for several days and were quite tame so that I could approach within a few yards of them.

106. *Merops philippinus.*—The Blue-tailed Bee-Eater. [1027.]

I never personally observed this species in the wild state in Baluchistan, but in September 1913 I saw a specimen in the flesh, which had just been shot and brought in to the Secretary of the MacMahon Museum at Quetta. It appeared to me to be a bird of this species in immature plumage.

107. *Merops persicus.*—The Blue-cheeked Bee-Eater. [1028.]

I have not personally observed this species in Baluchistan, but it certainly occurs there, and there are three specimens in the MacMahon Museum at Quetta, undoubtedly I think of this species.

108. *Merops apiaster.*—The European Bee-Eater. [1029.]

This species is common in Baluchistan. It appears in the Quetta Valley early in April, and leaves again for warmer regions in October. It breeds in the Quetta Valley, and probably all over Baluchistan. It is generally seen in scattered flocks. I obtained several specimens at different times in various parts of the Quetta Valley. There are 5 specimens of this species in the MacMahon Museum at Quetta.

ALCEDINIDÆ.

109. *Ceryle varia.*—The Indian Kingfisher. [1033.]

I observed this species on very few occasions in Baluchistan, and I do not think it is anywhere common. There are 5 specimens of this species in the MacMahon Museum at Quetta.

110. *Alcedo ispeda.*—The Common Kingfisher. [1035.]

A few of these birds are generally to be seen by running streams in Baluchistan, such as the stream in the Urak Valley, which furnishes the Quetta water-supply, and the little stream running past the Murree Brewery near Quetta. A few pairs nest every year in the localities named. There are 2 specimens of this species in the MacMahon Museum at Quetta.

111. *Halcyon smyrnensis.*—The White-breasted Kingfisher. [1044.]

I have occasionally observed this species in Baluchistan, but it is nowhere common. There are four specimens in the MacMahon Museum at Quetta.

UPUPIDÆ.

112. *Upupa epops.*—The European Hoopoo. [1066.]

Common in Baluchistan, and certainly breeds there. I obtained two specimens in the Galbraith Spinney near Quetta, in August 1913. This species migrates to warmer regions during the winter. There are four specimens in the MacMahon Museum at Quetta. Marshall records a nest with young found on May 18th.

CYPSELIDÆ.

113. *Cypselus melba.*—The Alpine Swift. [1068.]

I saw a small scattered flock of about 6 of these fine swifts flying about over the Gloucester Road in Quetta in June 1912, and again observed small scattered parties flying over Quetta in June 1913, also again in July 1913 at Ziarat, and in the valleys between Kach and Ziarat. I

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think there can be little doubt that this species breeds in the higher mountains in Baluchistan, among the rocky precipices. There is one specimen in the MacMahon Museum at Quetta.

114. *Cypselus apus.*—The European Swift. [1069.]

I frequently observed swifts flying over Quetta, which might have been of this species, but I never obtained a specimen. Marshall states that this is the commonest swift near Quetta, arriving in the beginning of May in large numbers, and that he found nests of this species in the root of a cave on May 31st. I cannot help thinking that he may have been mistaken and that the birds he referred to were really the next species, *Cypselus murinus.* I think however that a certain number of *Cypselus apus* also pass through Baluchistan every year. There is one specimen, said to be of this species, in the MacMahon Museum at Quetta.

115. *Cypselus murinus.*—The Pale Brown Swift. [1070.]

This is the species, which I believe to be the common one in Baluchistan in summer, not *Cypselus apus,* as stated by Marshall. I saw many which I believe were of this species, in the valleys between Kach and Ziarat, in June and July and these were undoubtedly breeding there.

116. *Cypselus affinis.*—The Common Indian Swift. [1073.]

I personally observed this species but rarely in the Quetta Valley, but Marshall states that it is common in the hot weather, and that it arrives at the end of April. He records having found three nests with fresh eggs in the root of a cave on May 17th.

Caprimulgidæ.

117. *Caprimulgus europæus.*—The European Nightjar. [1092.]

Fairly common in summer, but never seen in winter as it migrates to warmer regions for the winter months. I think it certainly breeds in Baluchistan and I could mention as localities the Woodcock Spinney and Galbraith Spinney near Quetta, where I have very little doubt that nests could be found.

Cuculidæ.

118. *Cuculus canorus.*—The Cuckoo. [1104.]

A summer visitant to Baluchistan, and fairly common in the higher mountains. A good many, I think, breed at Ziarat at 8,000 feet and upwards, probably using the nests of Pipits and Buntings to lay their eggs in, though I never actually found any myself. I have occasionally seen Cuckoos in the Quetta Valley. In winter they migrate to warmer regions. There is one specimen of this species in the MacMahon Museum at Quetta.

Psittacidæ.

119. *Palaeornis torquatus.*—The Rose-ringed Parroquet. [1138.]

I have occasionally seen small parties of this species in the gardens in Quetta, but I do not think it breeds in Baluchistan, as I never saw them before July, and they stay on till late in the autumn before migrating to warmer regions. In November 1913 I obtained a specimen in my garden in Quetta. There are three specimens of this species in the MacMahon Museum at Quetta.

Strigidæ.

120. *Bubo ignavus.*—The Eagle Owl. [1167.]

A constant resident in Baluchistan, though sparsely distributed. It breeds in the mountains of Baluchistan. In 1912 Major Marshall, R. G. A.,

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had a young bird alive in his garden, which had been taken from a nest among the rocks by a Pathan. This bird he eventually presented to the Zoological Gardens at Karachi. In his notes Marshall records shooting a bird of this species in November. There are two specimens in the Mac Mahon Museum at Quetta.

121. *Athene bactriana.*—Hutten's Owlet. [1174.]

I frequently observed these birds among the rocks between Quetta and Chaman, and also between Quetta and Kach. I think it certainly breeds in Baluchistan, as I saw this species in almost every month of the year, including May, June, and July. There are four specimens in the MacMahon Museum at Quetta.

VULTURIDÆ.

122. *Vultur monachus.*—The Cinereous Vulture. [1190.]

A resident species in Baluchistan, and breeds there. On April 5th, 1913, I took an egg from an eyrie on the top of a Juniper tree on Zarghun Mountain at an altitude of about 10,500 feet. I shot the female as she left the eyrie, she measured just under 9 feet from tip to tip of the wings. There is a specimen of this species in the MacMahon Museum at Quetta, shot at Ziarat.

123. *Gyps fulvus.*—The Griffon Vulture. [1192.]

A resident species in Baluchistan, and very common. It breeds in the mountains on high cliffs. Marshall records finding a nest on a high cliff, and that the young bird was hatched on April 25th. There is one specimen of this species in the MacMahon Museum at Quetta.

124. *Neophron percnopterus.*—The Large White Scavenger Vulture. [1198.]

Very common in Baluchistan at all seasons, and breeds in the mountains. There are two specimens of this species in the MacMahon Museum at Quetta.

FALCONIDÆ.

125. *Gypœtus barbatus.*—The Bearded Vulture, or Lammergeyer. [1199.]

Common throughout Baluchistan at all seasons, and breeds in the cliffs in the high mountains. Major Marshall, R. G. A., had one of these birds alive in his garden at Quetta for some time in 1912. I shot a fine specimen at Neli Kuch in the Gomal Valley in January 1891. Marshall records finding one nest with young birds in it in the beginning of April, and one nest with an egg in it on March 6th. There are two specimens of this species in the MacMahon Museum at Quetta.

126. *Aquila chrysætus.*—The Golden Eagle [1200.]

Fairly common in the mountains of Baluchistan, where it also breeds. Some of these birds are always to be seen in the Hanna and Urak Valleys and also in the Marruchak Valley. Major Marshall, R. G. A., had a fine young bird alive in his garden in Quetta in 1912. It had been taken from the eyrie and brought to him by a Pathan. It was in his garden for some time after it was full-grown, and I took several interesting photographs of it. He finally gave it to the Zoological Gardens at Karachi. In the spring of 1913 a Pathan brought me an egg, slightly incubated, which he said he was positive was of this species, but it seemed abnormally small, so I am doubtful about it. I have often seen these splendid birds beating along the mountain sides in pairs for Chikore, and on one occasion I was only just in time to prevent one of them carrying off a Chikore I had shot. Marshall records that he had two eggs brought to him by Pathans, who showed him the eyrie from which the second egg was taken

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in 1912. The Pathan had shot the bird and brought it to Major Marshall who identified it as a Golden Eagle. The other egg was taken in 1911. There is one specimen in the MacMahon Museum at Quetta of this species.

127. *Hierætus fasciatus.*—Bonelli's Eagle. [1207.]

I occasionally observed these birds at a distance, but so far off that I was never quite certain of them. There can be no doubt though that it is a resident species, and Marshall records two nests found in the mountains, one on May 14th with one egg much incubated, and one on May 26th with two eggs, slightly incubated.

128. *Butastur teesa.*—The White-eyed Buzzard Eagle. [1220.]

Fairly common in the Quetta Valley during the winter months, but I never saw it in summer, and I do not think it stays to breed.

129. *Milvus govinda.*—The Common Pariah Kite. [1229.]

Very common in Baluchistan, and no doubt breeds there, though I never found a nest myself.

130. *Milvus migrans.*—The Black Kite. [1231.]

I occasionally observed this species in the Quetta Valley during the winter months. Marshall states that it breeds in the hills near Quetta, and records obtaining three fresh eggs from a nest about 12th April.

131. *Elanus cæruleus.*—The Black-winged Kite. [1232.]

I occasionally observed this species in the Quetta Valley in the winter months, but never obtained a specimen. I never saw it in the summer.

132. *Circus macrurus.*—The Pale Harrier. [1233.]

Fairly common in the Quetta Valley in winter, but I never saw it in summer, and I do not think it stays to breed.

133. *Circus cyaneus.*—The Hen Harrier. [1235.]

Fairly common in the Quetta Valley during the winter months, but like the last species, is not seen in summer. I shot two specimens along the Lora River, about three miles from Quetta, in November 1913. There is one specimen in the MacMahon Museum at Quetta. The birds shot by me were in immature plumage.

134. *Circus æruginosus.*—The Marsh Harrier. [1237.]

Fairly common in Baluchistan in marshy localities during winter, but never I think seen in summer, I do not think it ever remains to breed.

135. *Buteo ferox.*—The Long-legged Buzzard. [1239.]

Fairly common in Baluchistan and is a resident species all through the year. It certainly breeds at Ziarat at 8,000 feet and upwards; and the birds seen there were mostly of the dark or melanistic variety. In October 1912 I got a specimen of this species, shot at Quetta by Major Marshall, R. G. A., and it was of the pale variety. I sent this specimen to the Bombay Natural History Society. There are two specimens in the Mac Mahon Museum at Quetta. I several times in winter saw specimens of the pale variety on the upper Gymkhana at Quetta.

136. *Accipiter nisus.*—The Sparrow-Hawk. [1247.]

Common in Baluchistan, and I think certainly breeds there, especially in the wooded tracts, as in the vicinity of Ziarat. This species is mostly in evidence in Quetta during the winter, where it follows the flocks of small birds which are very numerous in winter. Several specimens were shot in 1913 by Capt. Meinertzhagen, 7th Royal Fusiliers, and one in 1912 by Major Marshall, R. G. A. There is one specimen of this species in the MacMahon Museum at Quetta.

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137. *Falco peregrinus.*—The Peregrine Falcon. [1254.]

This species is occasionally seen during the winter months, especially in the localities where the various species of wild ducks congregate, as at Khusdil Khan. I never observed this species during the summer, but think it is quite possible that some stay to breed, as there are in many places cliffs, such as this species likes to nest on.

138. *Falco jugger.*—The Luggar Falcon. [1257.]

Fairly common during the winter months. I think it is probable that some stay to breed in Baluchistan. Marshall records seeing a pair in April which were as far as he could see, building a nest high up on the face of a cliff.

139. *Tinnunculus alaudarius.*—The Kestrel. [1265.]

Common in Baluchistan, and breeds there. I saw pairs at Ziarat which were certainly breeding on the cliffs in June between 8,000 and 9,000 feet. Marshall records taking four fresh eggs from a nest on May 14th. There are two specimens in the MacMahon Museum at Quetta.

COLUMBIDÆ.

140. *Columba intermedia.*—The Indian Blue-Rock Pigeon. [1292.]

Common in the Quetta Valley at all seasons. They are seen in large flocks during winter. They breed in the "Karewes" or under-ground water-channels, into which shafts are sunk at intervals, and often give sport in winter, when they fly out of these shafts on being disturbed by stones thrown into them. I frequently shot them in this way in the Quetta Valley, and also in the Zhob and Gomal Valleys. There are two specimens of this species in the MacMahon Museum at Quetta.

141. *Columba livia.*—The Blue-Rock Pigeon. [1293.]

Common in the Quetta Valley, though, perhaps, not so numerous as the foregoing species, but its habits are the same, and it also breeds in the Karewe shafts. I have shot this species also in the Quetta Valley and in the Zhob and Gomal Valleys. There are two specimens in the MacMahon Museum at Quetta.

142. *Palumbus casiotis.*—The Eastern Wood-pigeon, or Ring-Dove. [1298.]

Common in the Juniper forest at Ziarat, from 8,000 feet upwards, and undoubtedly breeds there. I also shot this species in the Zhob Valley from March to May. There are two specimens in the MacMahon Museum at Quetta.

143. *Turtur cambayensis.*—The Little Brown Dove. [1309.]

Common everywhere in Baluchistan and certainly some birds remain throughout the winter. It breeds in Baluchistan. I frequently found nests in the spinneys and gardens, and one pair had a nest in the climbing roses round the front of my house in Quetta. There are two specimens in the MacMahon Museum at Quetta.

144. *Turtur risorius.*—The Indian Ring-Dove. [1310.]

Common in Baluchistan and some birds remain during winter. It breeds in the gardens and orchards, and I found many nests in May. There are three specimens in the MacMahon Museum at Quetta.

PTEROCLIDÆ.

145. *Pterocles arenarius.*—The Large or Black-bellied Sandgrouse. [1316.]

Common in the open sandy valleys of Baluchistan, especially during spring and autumn, and I think it certainly breeds in Baluchistan. I shot some of these birds in the upper Zhob Valley in April and May 1891. There are four specimens in the MacMahon Museum at Quetta.

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146. *Pterocles lichtensteini.*—The Close-barred Sandgrouse. [1318.]

I believe I observed this species on one occasion in Baluchistan, but am not certain of this. Blanford states on page 57 of Vol. IV that this species is found in Baluchistan, and is probably resident throughout its range.

147. *Pterocles coronatus.*—The Coronetted Sandgrouse. [1319.]

A resident species in Baluchistan, and I think no doubt breeds there. I shot one of these birds in the Zhob Valley in January 1891. I do not think it is anywhere common. There is one specimen in the MacMahon Museum at Quetta.

148. *Pteroclurus alchata.*—The large Pin-tailed Sandgrouse. [1320.]

Fairly common in flocks in spring and autumn, but I do not think it remains to breed, except perhaps in the higher valleys. There is one specimen in the MacMahon Museum at Quetta.

149. *Pteroclurus exustus.*—The Common Sandgrouse. [1321.]

Common in flocks in Baluchistan in spring and autumn, though not so numerous as *Pterocles arenarius*, which is, I think, the commonest sandgrouse in Baluchistan. I do not think this species breeds in Baluchistan.

150. *Pteroclurus senegallus.*—The Spotted Sandgrouse. [1322.]

I have never personally observed this species in Baluchistan, but Blanford on page 62 of Vol. IV states that it is distributed from Northern Africa to South-Western Asia, and mentions a specimen from Pirchoki, below the Bolan Pass. There is also a specimen in the MacMahon Museum at Quetta, said to be of this species.

PHASIANIDÆ.

151. *Coturnix communis.*—The Common or Grey Quail. [1355.]

Found in Baluchistan in spring and autumn, but only sparingly, and apparently it does not breed in Baluchistan, but only passes through on migration. There are three specimens in the MacMahon Museum at Quetta.

152. *Caccabis chucar.*—The Chukor. [1370.]

Very common in all the mountains of Baluchistan, and breeds everywhere in the mountains but not in the open valleys. Very good sport is obtainable with these birds in many places in Baluchistan, as they fly strongly, and have to be hit well forward to bring them down. I have shot many in the Zhob Valley, as well as in the valleys near Quetta. There are five specimens in the MacMahon Museum at Quetta.

153. *Ammoperdix bonhami.*—The See-See. [1371.]

Common all over Baluchistan, and breeds everywhere like the Chukor; it is a resident species all the year round, and gives good sport with the gun. I shot many of these birds all the way up the Zhob Valley, and also in the mountains and valleys near Quetta. This species comes more down into the open valleys than does the Chukor. There are four specimens in the MacMahon Museum at Quetta.

154. *Francolinus vulgaris.*—The Black Partridge or Common Francolin [1372.]

I never observed this species in Baluchistan myself, but to my certain knowledge a cock bird was shot in the Galbraith Spinney, about 2½ miles from Quetta, by Captain Meinertzhagen, 7th Royal Fusiliers, and I think it was in the month of November 1913. I do not think this species breeds in Baluchistan, except possibly in the districts towards the plains of India to the East. There is one specimen in the MacMahon Museum at Quetta.

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RALLIDÆ.

155. *Rallus aquaticus.*—The Water Rail. [1388.]

I have not personally observed this species in Baluchistan, but Blanford states on page 160 of Vol. IV that it is found throughout Europe and the Palæarctic region as far West as Yarkand and Cabul, and there is a specimen, said to be of this species, in the MacMahon Museum at Quetta.

156. *Porzana parva.*—The Little Crake. [1392.]

I have not personally observed this species in Baluchistan, but on page 164 of Vol. IV Blanford states that it has been observed passing through Quetta, when migrating. It probably therefore visits Baluchistan both in spring and in autumn.

157. *Porzana pusilla.*—The Eastern Baillon's Crake. [1393.]

I have not personally observed this species in Baluchistan, but there is in the MacMahon Museum at Quetta a specimen, said to be of this species. I think, however, that this specimen is more probably one of "*Porzana intermedia,*" as Blanford on page 166 of Vol. IV states that throughout Western Asia, *Porzana pusilla* is replaced by *Porzana intermedia.*

158. *Porzana maruetta.*—The Spotted Crake. [1394.]

I have not personally observed this species in Baluchistan, but on page 167 of Vol. IV Blanford states that this species is found in summer in Western and Central Asia, and in India in the winter, so it must either be resident in Baluchistan in summer, or pass through it in going to and from India on migration. There are two specimens in the MacMahon Museum at Quetta, said to be of this species.

159. *Porphyrio poliocepholus.*—The Purple Moorhen. [1404.]

I have not personally observed this species in Baluchistan, but Blanford states on page 179 of Vol. IV that this species ranges from India throughout South-Western Asia to the Caspian. Marshall records that he saw seven or eight of these birds together in thick reeds in a small river near Quetta. He was of opinion that they probably bred near there, and that this was a family. There are two specimens of this species in the MacMahon Museum at Quetta.

160. *Fulica atra.*—The Coot. [1405].

This species is very common on the lake at Khushdil Khan, about 40 miles from Quetta, and on other open pieces of water. It seems to be uncertain whether any remain to breed in Baluchistan. There are two specimens of this species in the MacMahon Museum at Quetta.

GRUIDÆ.

161. *Grus communis.*—The Common Crane. [1407.]

I once saw on a clear day in March a large flock of Cranes flying very high up over Quetta and evidently migrating northwards. From their notes I feel sure that these birds were of this species, and I think they must pass through Baluchistan every year during their spring and autumn migration.

OTIDIDÆ.

162. *Houbara macqueeni.*—The Houbara. [1415.]

Found sparingly in Baluchistan. I came across them in various places in the Gomal and Zhob Valleys in 1891, and obtained one specimen between Gul Kach and Nawa Obo in December 1890. Marshall states that it passes through Baluchistan in fairly large numbers in March and April.

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OEDICNEMIDÆ.

163. *Œdicnemus scolopax.*—The Stone Curlew. [1418.]
I have not personally observed this species in Baluchistan, but on page 205 of Vol. IV Blanford states that it is found in Central and South-Western Asia, and Marshall records that one was shot out of a pair in very cold weather in March. He does not give the locality.

GLAREOLIDÆ.

164. *Cursorius gallicus.*—The Green-coloured Courier Plover. [1423.]
Sparsely distributed in Baluchistan. I shot several of these birds in the Zhob Valley in the spring of 1891. Marshall records shooting two in September. I think some probably breed in Baluchistan. There is one specimen in the MacMahon Museum at Quetta.

CHARADRIIDÆ.

165. *Sarcogrammus indicus.*—The Red-wattled Lapwing. [1431.]
Found sparsely in Baluchistan. Have seen them at odd times in the Quetta Valley during the winter months. I also saw a few at Ziarat at about 8,000 feet in June and July, and I think there can be little doubt that it breeds there. Marshall records one being shot in March, in very cold weather, near Quetta. There is one specimen of this species in the MacMahon Museum at Quetta.

166. *Vanellus vulgaris.*—The Lapwing or Peewit. [1436.]
Some of these birds are seen every winter in the Quetta Valley but I do not think it ever appears in large numbers nor do I think that any remain to breed in Baluchistan. I frequently saw a few in winter near the Lora River in the fields. There is one specimen in the MacMahon Museum at Quetta.

167. *Chettusia leucura.*—The White-tailed Lapwing. [1438.]
This species passes through Baluchistan in its spring and autumn migration. I saw several small flocks in the autumn of 1912 in the Quetta Valley, and obtained one specimen shot by Major Marshall, R. G. A I sent the skin to the South Kensington Museum, where it was identified as this species.

168. *Charadrius pluvialis.*—The Golden Plover. [1440.]
I have not personally observed this species in Baluchistan, but on page 235 of Vol. IV, Blanford records that he shot one at Gwadar in Baluchistan in January 1872. It probably passes through both in spring and autumn.

169. *Ægialitis geoffroyi.*—The Large Sand-Plover. [1442.]
I have not personally observed this species in Baluchistan, but Marshall records that one was brought to him in March, which had been shot out of a small flock of five or six birds, and he identified it as this species. If this identification is correct, it appears that this species must range further to the West than is stated by Blanford.

170. *Ægialitis dubia.*—The Little-Ringed Plover. [1447.]
Have often seen flocks of these little Plovers in the Quetta Valley in early spring. I think it is probable that a certain number breed in Baluchistan.

171. *Himantopus candidus.*—The Black-winged Stilt. [1451.]
Fairly common in suitable places in Baluchistan, and I believe breeds on Khushdil Khan Lake.

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172. *Totanus hypoleucas.*—The Common Sandpiper. [1460.]
I occasionally observed this species in the Quetta Valley during the winter months, but never obtained a specimen. It is possible some may breed at Khushdil Khan.

173. *Totanus ochropus.*—The Green Sandpiper. [1462.]
Fairly common in the Quetta Valley at times I think some must breed in Baluchistan, as I have seen them in July and August. There is a specimen of this species in the MacMahon Museum at Quetta.

174. *Totanus fuscus.*—The Spotted Redshank. [1465.]
I have not personally observed this species in Baluchistan, but there are two specimens, said to be of this species, in the MacMahon Museum at Quetta. On page 265 of Vol. IV, Blanford states that this species migrates in winter to the countries round the Mediterranean and Southern Asia. It is, therefore, presumable that it passes through Baluchistan in its spring and autumn migrations.

175. *Totanus glottis.*—The Greenshank. [1466.]
I have not personally observed this species in Baluchistan, but there is a specimen said to be of this species in the MacMahon Museum at Quetta. On page 267 of Vol. IV, Blanford states that this species winters in Southern Asia, so it is safe to assume that it passes through Baluchistan in its springs and autumn migrations.

176. *Pavoncella pugnax.*—The Ruff and Reeve. [1468.]
This species passes through Baluchistan in its spring and autumn migration. In October 1912 as far as I can remember, I obtained a specimen shot by Major Marshall, R. G. A. I sent the skin to the Natural History Museum, South Kensington, where it was identified as that of a Ruff. I several times observed flocks of these birds in the Quetta Valley in October.

177. *Calidris arenaria.*—The Sanderling. [1469.]
I have not personally observed this species in Baluchistan, but on page 270 of Vol. IV, Blanford states that this species is common in winter on the coast of Sind and Baluchistan, so presumably this species also passes through Baluchistan in its spring and autumn migration.

178. *Tringa minuta.*—The Little Stint. [1471.]
I frequently observed one or two of these birds by the Lora River near Quetta during the winter months. There are two specimens, said to be of these species, in the MacMahon Museum at Quetta.

179. *Phalaropus hyperboreus.*—The Red-necked Phalarope. [1480.]
I have not personally observed this species in Baluchistan, but there is a specimen in the MacMahon Museum at Quetta, said to be of this species. On page 282 of Vol. IV, Blanford states that in winter it abounds on the coasts of Arabia, Baluchistan and Sind. It can be presumed, therefore, that it passes through Baluchistan in its spring and autumn migration.

180. *Scolopax rusticula.*—The Woodcock. [1482.]
A winter visitant to Baluchistan. Some of these birds are shot every winter in the Quetta Valley. There are several specimens in the MacMahon Museum at Quetta.

181. *Gallinago cœlestis.*—The Common Snipe. [1484.]
This species is fairly common in Baluchistan in suitable places during the winter months, especially November and March. I do not think any remain to breed.

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182. *Gallinago solitaria.*—The Himalayan Solitary Snipe. [1486.]
A good many isolated specimens of this species are shot in Baluchistan in the winter months. Five or six were shot to my knowledge in the winter of 1913-1914. One shot on October 12th, 1913, by Capt. Brown, 58th Rifles, was sent to me by Lt.-Col. Venour, commanding that Regiment. I skinned the bird and the specimen is now in the MacMahon Museum at Quetta, where there are also several other specimens. It is a winter visitant only.

183. *Gallinago gallinula.*—The Jack Snipe. [1487.]
A few birds of this species are shot every year in Baluchistan in the winter months. One was shot in October 1913 at the edge of the Lora River near the Galbraith Spinney, Quetta Valley, by Capt. Pery Knox Gore, Royal Welch Fusiliers, who was out with me. This species is also only a winter visitant.

LARIDÆ.

184. *Larus ridibundus.*—The Laughing Gull. [1490.]
Fairly common in Baluchistan, during the winter months, on pieces of water like Khushdil Khan Lake. It does not remain to breed. There are four specimens in the MacMahon Museum at Quetta.

185. *Hydroprogne caspia.*—The Caspian Tern. [1498.]
This species is found on Khushdil Khan Lake, and probably in other similar places in Baluchistan. There is one specimen in the MacMahon Museum at Quetta.

186. *Sterna cantiaca.*—The Sandwich Tern. [1500.]
This species is found in Baluchistan during the winter months, but does not stay to breed. There is one specimen in the MacMahon Museum at Quetta from Las Beyla.

PELECANIDÆ.

187. *Pelecanus onocrotalus.*—The White or Roseate Pelican. [1521.]
A resident species in Baluchistan in suitable localities. There were four specimens in the MacMahon Museum. Marshall records seeing these birds migrating in February at Baton Kuch. He says *Pelecanus roseus*, but probably it was this species.

PHALACROCORACIDÆ.

188. *Phalacrocorax carbo.*—The Large Cormorant. [1526.]
Not common, but some are always to be seen on pieces of water like the Khushdil Khan Lake. I do not think they breed in Baluchistan. There is a specimen in the MacMahon Museum at Quetta.

SULIDÆ.

189. *Sula leucogaster.*—The Brown Gannet. [1530.]
A shore bird. There is a specimen in the MacMahon Museum at Quetta. It is said to be common in the coast of Baluchistan.

IBIBIDÆ.

190. *Plegadis falcinellus.*—The Glossy Ibis. [1544.]
I occasionally saw this species in the Quetta Valley in winter. There are two specimens, said to be of this species, in the MacMahon Museum at Quetta.

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CICONINÆ.

191. *Ciconia alba.*—The White Stork. [1546.]
I have not personally observed this species in Baluchistan, but there is a specimen in the MacMahon Museum at Quetta, said to be of this species.

192. *Ciconia nigra.*—The Black Stork. [1547.]
I have not personally observed this species in Baluchistan, but it seems undoubtedly to occur there, and there is a specimen, said to be of these species, in the MacMahon Museum at Quetta.

ARDEIDÆ.

193. *Ardea cinerea.*—The Common Heron. [1555.]
Fairly common in Baluchistan on suitable pieces of water, such as Khushdil Khan Lake, in winter. There is a specimen in the MacMahon Museum at Quetta.

194. *Herodias alba.*—The Large Egret. [1559.]
Marshall records that this species is fairly numerous at Khushdil Khan Lake in February. It is probably found at all similar pieces of water in Baluchistan. I do not know if it breeds in Baluchistan.

195. *Lepterodius asha.*—The Indian Reep-Heron. [1553.]
I have not personally seen this species in Baluchistan but there is no doubt that it is found in Baluchistan, especially at or near the coast. It is probable that it also breeds there, as Blanford on page 391 of Vol. IV records that it frequents the shore of the Indian Ocean from the Persian Gulf to Ceylon, and that it breeds in May on Mangrove trees. There are two specimens in the MacMahon Museum at Quetta.

196. *Nycticorax griseus.*—The Night Heron. [1568.]
This species is found in Baluchistan, but is not common. There are four specimens in the MacMahon Museum at Quetta.

197. *Ardetta minuta.*—The Little Bittern. [1570.]
This species is found in Baluchistan in suitable places, such as the bed of the Lora River near Quetta. There are three specimens in the MacMahon Museum.

198. *Botaurus stellaris.*—The Bittern. [1574.]
Not common in Baluchistan, but is found in the bed of the Lora River and similar places. There are four specimens in the MacMahon Museum at Quetta.

PHÆNICOPTERIDÆ.

199. *Phœnicopterus roseus.*—The Common Flamingo. [1575.]
These beautiful birds occur occasionally in flocks in Baluchistan. Marshall records having seen a large flock, probably 200 or 300, at Khushdil Khan Lake in March, but he supposed them to be migrating, as they did not alight. There are seven specimens in the MacMahon Museum at Quetta.

ANATIDÆ.

200. *Cygnus olor.*—The Mute Swan. [1577.]
An occasional cold weather visitant to Baluchistan. Their arrival means severe cold in the North. There is one specimen in the MacMahon Museum at Quetta.

201. *Anser ferus.*—The Grey-lag Goose. [1579.]
These species passes through Baluchistan in its spring and autumn migration, but is never numerous and does not stay for long. There are two specimens in the MacMahon Museum at Quetta.

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202. *Tadorna cornuta.*—The Sheldrake. [1587.]
This species visits Baluchistan during the winter months, but is not common. Marshall records having seen two at Khushdil Khan Lake in February and March. There are seven specimens in the MacMahon Museum at Quetta.

203. *Casarca rutila.*—The Ruddy Sheldrake, or Brahminy Duck. [1588.]
This species passes through Baluchistan in its spring and autumn migration, being commonest in February and March. It is then to be seen at Khushdil Khan Lake.

204. *Anas boscas.*—The Mallard. [1592.]
Common in Baluchistan during the winter months in suitable places, such as the Khushdil Khan Lake. There are three specimens in the MacMahon Museum at Quetta.

205. *Chaulelasmus streperus.*—The Gadwall. [1595.]
Occurs in Baluchistan during the winter months, but is not common. There are two specimens in the MacMahon Museum at Quetta.

206. *Nettium crecca.*—The Common Teal. [1597.]
Common in Baluchistan during the winter months, especially at the beginning and end of winter. There are four specimens in the MacMahon Museum at Quetta.

207. *Mareca penelope.*—The Wigeon. [1599.]
Fairly common during the winter months in Baluchistan, especially at the beginning and end of winter. I shot a specimen in immature plumage in November 1912, and sent the skin to the Natural History Museum, South Kensington, where it was identified as being one of the species. I shot this bird on the Lora River near Quetta. There are two specimens of this species in the MacMahon Museum at Quetta.

208. *Dafila acuta.*—The Pintail. [1600.]
Occurs in Baluchistan during the winter months. A few are always shot at the Khushdil Khan Lake in February and March. There are three specimens in the MacMahon Museum at Quetta.

209. *Querguedula circia.*—The Garganey. [1601.]
Occurs in Baluchistan during the winter months, but is not common. A few are shot at Khushdil Khan Lake every year in February and March.

210. *Spatula clypeata.*—The Shoveller. [1602.]
Fairly common in Baluchistan during the winter months. A good many are shot on the Khushdil Khan Lake. There are three specimens in the MacMahon Museum at Quetta.

211. *Marmaronetta angustirostris.*—The Marbled Duck. [1603.]
Fairly common in Baluchistan, and this is one of the few species of ducks which remain to breed in Baluchistan, as it has been found breeding on the Khushdil Khan Lake. There are five specimens in the MacMahon Museum at Quetta.

212. *Netta rufina.*—The Red-crested Pochard. [1604.]
Common in Baluchistan during the winter months, especially at the beginning and at the end of the winter. There are three specimens in the MacMahon Museum at Quetta.

213. *Nyroca ferina.*—The Pochard or Dun-Bird. [1605.]
Common in Baluchistan during the winter months in such places as the Khushdil Khan Lake, especially at the beginning and end of the winter. There are two specimens in the MacMahon Museum at Quetta.

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214. *Nyroca ferruginea.*—The White-eyed Duck. [1606.]
Fairly common during the winter months in Baluchistan, especially at the beginning and end of the winter. A good many are usually shot in February and beginning of March on Khushdil Khan Lake. There is one specimen in the MacMahon Museum at Quetta.

215. *Nyroca fuligula.*—The Tufted Duck. [1609.]
Fairly common in Baluchistan during the winter months, at end of winter especially. A good many are usually shot on the Khushdil Khan Lake in March.

216. *Clangula glaucion.*—The Golden-eye Duck. [1610.]
Occurs in Baluchistan, especially towards the end of the winter, but is not common. A few are shot every year on the Khushdil Khan Lake. There are two specimens in the MacMahon Museum at Quetta.

217. *Erismatura leucocephala.*—The White-headed Duck. [1611.]
A few of these birds appear in Baluchistan every winter, especially towards the end of the winter. Marshall records that he shot two, out of a lot of about six, on Khushdil Khan Lake in February. There are three specimens in the MacMahon Museum at Quetta.

218. *Mergus albellus.*—The Smew. [1612.]
Fairly common in Baluchistan during the winter months. Some we shot every year on the Khushdil Khan Lake. There are four specimens in the MacMahon Museum at Quetta.

PODICIPEDIDÆ.

219. *Podicipes cristatus.*—The Great crested Grebe. [1615.]
Some of these birds appear every winter in Baluchistan on suitable pieces of water like the Khushdil Khan Lake. There are two specimens in the MacMahon Museum at Quetta.

220. *Podicipes albipennis.*—The Indian Little Grebe, or Dabchick. [1617.]
Fairly common on suitable pieces of water in Baluchistan. This species is said to nest on the Lake at Khushdil Khan. There are three specimens in the MacMahon Museum at Quetta. Two of these specimens were obtained at Saranan, between Quetta and the Khojak.

ADDENDUM.

CHARADRIIDÆ.

221. *Numenius arquata.*—The Curlew. [1454.]
I have not personally observed this species in Baluchistan, but there is in the MacMahon Museum at Quetta a specimen from Saranan, between Quetta and the Khojak.

PLATALEIDÆ.

222. *Platalea leucorodia.*—The Spoonbill. [1545.]
I have not personally observed this species in Baluchistan, but there is a specimen from the Khushdil Khan Lake in the MacMahon Museum at Quetta.

ARDEIDÆ.

223. *Ardea manillensis.*—The Eastern Purple Heron. [1554.]
I have not personally observed this species in Baluchistan, but there are two specimens, obtained in Baluchistan, in the MacMahon Museum at Quetta.

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HEMIPTERA FROM THE BOMBAY PRESIDENCY

BY

DR. E. BERGROTH, C. M. Z. S.

The Hemiptera dealt with in this paper were collected and forwarded to me for study several years ago by Mr. R. C. Wroughton. Two new genera and some of the new species contained in the collection have been described by me in previous papers, and another new genus and species was described by the late Prof. Reuter. I now give a list of all the Hemiptera found by Mr. Wroughton, having marked with an asterisk the species that were undescribed when discovered by him. Only four of these species have as yet been found outside the Bombay Presidency, though they all are doubtless more widely spread. Bibliographical references are appended only to the species not described in Distant's "Fauna of British India : Rhynchota."

Suborder HETEROPTERA.

Fam. THYREOCORIDÆ.

1. *Aethus indicus*, Westw.
2. *Macroscytus foveola*, Dall.

*3. *Macroscytus longirostris*, n. sp.

Subovatus, convexiusculus, niger. Caput nonnihil transversum, rugosum, apice distincte incisum, rostro piceo coxas posticas superante, articulis tribus ultimis subæque longis, antennis piceis, articulis duobus primis sublinearibus glabris, ceteris nonnihil incrassatis pallido-puberulis, articulo secundo primo subbreviore, tertio secundo distincte longiore, quarto tertio et quinto quarto paullo longiore. Pronotum capite triplo latius, transversim vix impressum, lateribus parce ferrugineo-ciliatum, parte antica disci apice et lateribus modice dense punctata, ceteroquin lævi sed medio serie longitudinali punctorum interrupta, parte postica disci parce punctata, basi lævi. Scutellum remote punctatum. Hemelytra apicem abdominis nonnihil superantia, corio sat parce punctulato, basin segmenti ultimi connexivi attingente, intra marginem lateralem punctis piligeris duobus vel tribus instructum linea impressa percurrente prædito, margine apicali late levissime sinuato, membrana leviter infuscata. Abdomen subtus medio læve, lateribus irregulariter punctulatum. Pedes piceo-nigri, tarsis dilutioribus. Long. ♀ 7·5 mm.

The length of the rostrum would place this species in the genus *Gampsotes* Sign., but the *facies* is so different from that genus, that it is much better placed in *Macroscytus*, all other characters of which it has.

4. *Peltoxys brevipennis*, Fabr.

Parallelus, glaber, niger, et supra et subtus creberrime punctatus, capite et parte apicali pronoti pilis paucis longis præditis, ventre brevissime pubescente, lituris nonnulis dimidii antici pronoti, area parva oblonga prope angulos basales scutelli, vitta angusta intra marginem lateralem prosterni hujusque margine basali lævibus, rostro et tarsis testaceis. Caput subæque longum ac latum, tylo latiusculo, percurrente, jugis extus ante oculos subparallelis, deinde fortiter rotundatis, articulo primo antennarum apicem capitis attingente, secundo brevissimo quam primo breviore, tertio secundo saltem triplo longiore, apicem versus sensim incrassato, quarto tertio

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subæquilongo, subfusiformi (art. quintus deest in specimine descripto), rostro coxas medias attingente, articulo tertio secundo paullo breviore et quarto plus quam dimidio longiore. Mesosternum in fundo impressionis mediæ carinatum. Sulcus orificialis prope marginem anticum metasterni currens. Hemelytra abdomine paullo breviora, corio angulo apicali anguste rotundato, margine apicali in dimidio interno sinuato, membrana pellucida, leviter fusco-umbrata. Anguli apicales segmentorum abdominis levissime prominuli. Long. ♀ 4 mm.

Stål's and Signoret's descriptions of this rare insect are erroneous in several points, owing no doubt to the circumstance that they had only seen ill-preserved specimens. Dr. Horváth having kindly examined the specimen in the Budapest Museum, upon which Signoret founded his description, has found that it belongs to the same species as my specimen. The tubercles in the middle of the lateral margins of the abdominal segments described and figured by Signoret are, as Dr. Horváth writes to me, only small particles of dirt.

Fam.—Scutelleridæ.

5. *Scutellera perplexa*, Westw. (*nobilis*, Fabr. nec. L.)
6. *Chrysocoris purpureus*, Westw.

The ground-colour of the living insect and of specimens preserved in spirit is brassy green; in dried specimens it passes into purplish.

Fam. Pentatomidæ.

*7. *Scotinophara Westwoodi*, n. sp.

Ovalis, nigra, brevissime adpresse ochreo-squamulosa, dense punctulata, corio cum clavo remotius punctato, vitta obliqua sublaterali pronoti, hujus lobo antico, corio cum clavo, lateribus pleurarum ac limbo lato laterali ventris stramineo-variegatis, callo parvo prope angulos basales scutelli, tuberculo ad angulos apicales segmentorum ventralium summoque apice articulorum quattuor primorum antennarum stramineis, apice scutelli, rostro, tibiis posticis ac tarsis omnibus fuscis, articulationibus rostri plus minusve late stramineis, membrana hyalina, limbo laterali externo infuscato. Caput latitudine paullo longius, tuberculis antenniferis obtusiusculis, articulo secundo antennarum primo paullo longiore, tertio secundo vie duplo longiore, quarto tertio distincte breviore, quinto omnium longissimo, rostro basin segmenti tertii ventralis paullum superante. Pronotum ante medium distincte transversim impressum, antice modice declive, margine apicali depresso, parte postoculari subsinuato-truncato, dente angulorum lateralium dente apicale paullo minore, marginibus lateralibus anticis inermibus, distincte sinuatis, ante sinum leviter rotundatis. Scutellum saltem in mare apicem abdominis paullum superans, mox pone basin quadrantis secundi distincte constrictum, apice obtuse angulato-sinuatum. Segmentum sextum ventrale maris medio segmentis tribus præcedentibus unitis subæquilongum. Segmentum genitale maris apice utrinque sinuatum. Long. ♂ 8 mm.

This species seems to be akin to *S. nigra*, Dall., but it is partly variegated with yellow, the pronotum is not gibbous in front, and the scutellum is longer.

8. *Halys dentata*, Fabr.
9. *Laprius variicornis*, Dall.
*10. *Halyomorpha picticornis*, n. sp.

Oblongo-ovalis, testacea, supra inæqualiter acervatim fusco-punctata, vittis duabus ante medium pronoti subvirescenti-nigris apice scutelli pallidiore, linea longitudinali media pronoti et angulis basalibus scutelli lævibus, segmentis connexivi medio concoloriter punctatis, basi et apice fascia nigra notatis, capite subtus, metapleuris lateribusque ventris

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inæqualiter fusco-punctatis, vitta lata maculas aliquot testaceas includente propleuræ et mesopleuræ, macula majuscula marginali paullo ante angulos laterales propleurarum, fascia brevi mox ante angulos apicales segmentorum ventris maculaque media segmentorum hujus secundi et sexti piceo-nigris, mesosterno medio (carina excepta) fusco. Caput pronoto medio subæque longum, rostro basin ventris attingente, testaceo, articulo ultimo nigro, antennis testaceis, articulis tribus primis fusco-punctatis, primo præterea subtus fusco-vittato, quarto toto et parte plus quam dimidia apicali quini fuscis, articulo testio secundo paullo longiore, quarto tertio parum longiore, quinto quarto subæque longo. Pronotum margine apicali interoculari anguste sed distincte elevatum, marginibus lateralibus post medium non nisi levissime sinuatis. Hemelytra apicem abdominis paullum superantia, corio basin segmenti quinti connexivi superante, membrana cinerascente, intus prope basin et medio fusco-tincta. Abdomen subtus medio sublæve, segmento sexto maris medio quinto vix dimidio longiore, segmento genitali maris apice leviter arcuato-sinuato. Pedes testacei, femoribus (posteriorum parte basali excepta) et tibiis anterioribus maculis punctiformibus nigris conspersis, tibiis superne linea purpurea (in anticis minus distincta) signatis, apice late nigris, posticis etiam annulo subbasali nigro præditis, tarsis apice fuscis. Long. ♂ 12 mm.

Differs from *Halyomorpha*, Mayr, as defined by Stål, by having the pronotal apical margin distinctly though narrowly elevated; from this genus as restricted by Jeannel it differs by the male genital segment which is not deeply and angularly sinuate. As the other Indian species of the genus are imperfectly known, it is unnecessary for the present to separate it generically.

* 11. *Gulielmus laterarius*, Dist.

* 12. *Eusarcocoris proximus*, n. sp.

Late subovalis, flavotestaceus, dense nigro-punctatus, capite, articulo apicali rostri, macula transversa solum medio punctata nonnihil pone angulos apicales pronoti, ventre (limbo lato laterali excepto) maculaque oblongula ad angulos apicales segmentorum ventris nigris, antennis apicem versus nonnihil infuscatis, spiraculis fuscis, callo parvulo transverso prope angulos basales scutelli et margine laterali pronoti ventrisque lævibus, pedibus nigro-punctatis. Caput creberrime punctatum, cupreo-tinctum, articulis secundo et tertio antennarum æque longis, quarto tertio sesqui longiore, quinto quarto paullo longiore. Pronotum lateribus vix sinuatum, angulis lateralibus rotundatis, levissime prominulis. Scutellum abdomine nonnihil brevius, basi quam parte subapicali duplo latius, frenis medium scutelli vix attingentibus. Hemelytra apicem abdominis nonnihil superantia, corio scutello paullo longiore, membrana subhyalina. Segmentum genitale maris apice sat anguste et profunde sinuatum, fundo sinus arcuato. Long. ♂ 5 mm.

Distinguished from *E. guttigerus*, Thumb., by the considerably narrower postfrenal part of the scutellum.

13. *Nezara viridula*, L.
14. *Menida flavovaria*, Dall.
15. *Menida formosa*, Westw.
16. *Piezodorus rubrofasciatus*, Fabr.
17. *Cyclopetta obscura*, Lep.-Serv.

The specimens belong to Westwood's variety *siccifolia*.

Fam. ARADIDÆ.

18. *Mezira triangula*, Bergr.

Fam. COREIDÆ.

*19. *Aschistocoris bombæus*, Bergr., Ann. Soc. Ent. Belg. 1909, p. 185.

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20. *Notobitus dorsalis*, Westw.
21. *Cletus pugnator*, Fabr.
22. *Cletus bipunctatus*, H. Sch., Wanz. Ins. VI, 9, fig. 566; Stål, Enum. Hem. III, 78 (1873).

This very distinct and easily recognizable species has hitherto been recorded only from Java. Vol. VI of Herrich-Schœffer's work was finished in 1842, but it was published in parts, and there can be little doubt that the first Part, which contains the description of *C. bipunctatus*, appeared in 1840, or possibly at the end of 1839. *C. bipunctatus*, Westw. (1842), described under the same name by Distant in his Indian Fauna, is a synonym of the true *pugnator*, Fabr., which is not identical with *trigonus*, Thunb.

23. *Clavigralla horrens*, Dohrn.
24. *Leptocorixa variicornis*, Fabr.
25. *Dulichius inflatus*, Kirby.
*26. *Euthetus pulcherrimus*, Bergr., Ann. Soc. Ent. Belg. 1909, p. 186.
27. *Riptortus pedestris*, Fabr.
28. *Leptocoris*, sp.

Brachypterous form: hemelytra somewhat passing base of antepenultimate (♀) or penultimate (♂) abdominal segment, corium with sinuate apical margin and rounded apical angle, membrane extremely short, not reaching beyond apical angle of corium.

Possibly the hitherto unknown brachypterous form of *L. augur* Fabr., with which it agrees fairly well, though it is much smaller (length, ♂ 9 mm., ♀ 10·5 mm.)

Fam. PYRRHOCORIDÆ.

29. *Odontopus nigricornis*, Stål.
30. *Dysdercus Koenigi*, Fabr.

Fam. MYODOCHIDÆ.

31. *Pyrrhobaphus servus*, Fabr.
32. *Pamera Nietneri*, Dohrn.
*33. *Caridops gibba*, Bergr.
*34. *Prostemmidea mimica*, Reut.
35. *Lachnesthus singalensis*, Dohrn.

On this species Reuter founded the genus *Lachnophorus* (by a misprint called "*Lanchnophorus*") but as Dejean has described a genus of Carabidæ under the same name I propose the name *Lachnesthus* for Reuter's genus.

36. *Aphanus sordidus*, Fabr.
37. *Aphanus leucoceras*, Walk.

This species has somewhat the aspect of a *Dieuches* and was by Distant referred to that genus, but the short basal joint of the antennæ and the non-tuberculate male genital segment place it in *Aphanus*. As a synonym of this species Distant wrongly cites *Dieuches modestus*, Horv.

38. *Dieuches femoralis*, Dohrn.
*39. *Dieuches hypocrita*, n. sp.

Niger, dimidio basali corii, membrana ventreque fuscis, limbo laterali prothoracis (non tamen postice), maculis duabus parvis transversis marginis apicalis pronoti, linea longitudinali media postice evanescente lobi hujus postici, macula parva utrinque justa hanc, maculis duabus parvis mediis apiseque scutelli, margine angusto interiore et commissurali clavi, hujus macula minuta prope basin et striga exteriore dimidu basalis, strigis nonnullis et limbo costali dimidii basalis corii, striga interiore et macula magna costali introsum angustata dimidii hujus apicalis, macula minuta membranæ ad angulum basalem exteriorem et strigula obsolescente in

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dimidio basali venarum ejus quattuor exteriorum, limbo epipleurali corii (exceptis macula parva basali oblongaque mox pone medium et ad apicem), macula obsoleta apicali acetabulorum, angulis posticis metasterni limboque laterali abdominis a basi segmenti tertii usque ad medium quinti (ad suturam quartam interrupto) pallide flavis; antennæ et rostrum flavo-testacea, articulis tribus primis illarum apice leviter fuscescentibus, quarto fusco, annulo lato subbasali palide flavo ornato, articulo ultimo rostri piceo; pedes flavotestacei, trochanteribus et parte basali femorum pallide flavis, coxis, apice trochanterum, femoribus anticis (quadrante basali excepto), parte minus quam dimidia apicali mediorum parteque plus quam dimidia apicali posticorum nigris, apice tibiarum fusco. Caput lobo antico pronoti æque longum, vertice oculo duplo latiore, articulo primo antennarum capiti æque longo, tertio quam secundo breviore et quam quarto longiore, articulis tribus ultimis ostri erecte pilosulis. Pronotum æque longum ac latum, lateribus post medium levissime sinuatum, lobo antico quam postico sesqui longiore, hoc punctulato. Hemelitra (♂) apicem abdominis parum superantia, corio modice dence punctato, limbo costali impunctato, macula pallida costali postmediana parse et minute dilute fusco-punctulata, intus rotundata. Pectus fere impunctatum. Abdomen subtus subtilissime et brevissime sericeum. Femora antica nonnihil incrassata, subtus per fere totam longitudinem biseriatim spinulosa, spinulis serici posticæ (exterioris) minoribus, serie antica (interiore) nonnihil ante apicem spina una majore prædita; tibiæ anticæ maris subtus tuberculis sex setulam rigidam spinuliformem gerentibus instructæ. Articulus primus tarsorum posticorum ceteris duobus unitis triplo longior. Long. ♂ 11·5mm.

Distinguished from the other Indian species by the longer pronotum.

*40. *Metochus Horni* Bredd.

After comparison of the male specimen found near Bombay with a Ceylonese male specimen of *Horni* (given by Mr. Green to Dr. Luther as being *M. uniguttatus*, Thunb.) I find that it differs only in having the yellow apical margin of the last dorsal segment extremely narrow while it in the typical Ceylonese form is broad, occupying the apical third of the segment. I quite agree with Breddin that *M. uniguttatus*, as previously understood, consists of several perfectly distinct species. What the true *uniguttatus* is, can only be decided by a thorough re-examination and minute redescription of the type. There can be little doubt that *M. bengalensis*, Dall. and *assimilis*, Dall. (the latter not mentioned in Distant's Indian Fauna) are good species. The difficulties in the study of this genus are increased by the circumstance that the pronotum in many (not all) species is of different structure in the two sexes, being narrower with much longer anterior lobe in the male.

N.B.—*Metochus* Scott, which corresponds to Stäl's division *aa* of *Dieuches*, is certainly entitled to generic rank. The head is much broader than the apex of the pronotum, and the pronotal lateral margins are narrowly carinated and strongly sinuated, whereas in *Dieuches* the head is not or scarcely broader than the apex of the pronotum, and the pronotal lateral margins broadly laminately expanded and not or sarcely sinuated. Owing to this differences the *facies* of the two genera is quite different, and there are no species forming a transition between them. The differences between *Metochus* and *Dieuches* are in fact much greater than between *Dieuches* and *Beosus*. The name of the genus was correctly spelt by Scott; it was wrongly written *Methocus* by Lethierry and Severin and *Metocus* by Distant.

Fam. HENICOCEPHALIDÆ.

41. *Henicocephalus basalis*, Westw.

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Fam. REDUVIIDÆ.

42. *Polididus armatissimus*, Stäl.

*43. *Nagusta macroloba*, Bergr.

In his Indian Fauna Distant has translated my Latin description of this species into English, but in two places the word *ocelli* is rendered with "eyes", the description of the pale markings of the head is quite incorrectly rendered, and the strongly produced lateral lobe of the female abdomen—one of the principal characters of the species—is not mentioned at all. I must therefore refer to my original description.

44. *Rihirbus trochantericus*, Stäl.

The specimen (a ♂) resembles Reuter's variety *testacea*, but the head is black above, excluding the base. This species is so variable in colour that scarcely any two specimens are quite alike. It is not advisable to give names to these varieties. The black colour is more dominant in the female.

*45. *Epidaus alternus*, n. sp.

Fusco-testaceus, abdomine lateribus fusco, sed dimidio postico limbi lateralis segmentorum quattuor mediorum albido, articulo primo antennarum basin versus pallescente, femoribus anticis ferrugineis, annulo obsoleto medio et distincto dimidii apicalis femorum annuloque dimidii basalis tibiarum albescentibus, pronoto et pectore breviter ochreo-sericeis. Caput pone antennas tuberculo parvo obtuso instructum, articulo primo antennarum capite, pronoto scutelloque unitis longiore, medium corporis superante, articulo primo rostri ceteris conjunctis æque longo, marginem posticum oculorum subattingente. Pronotum capiti æque longum, tuberculo angulorum apicalium brevi, sed apice acuto, spinis lobi postici longiusculis, acutis, asquilongis, spinis humeralibus extrorsum et sursum directis, marginibus lateralibus posticis pone spinas humerales dente destitutis, angulis basalibus levissime obtuse prominulis. (Scutellum acu lacsum, haud describendum.) Hemelytra apicem abdominis nonnihil superantia, corio subglabro, maculis parvis tomentosis destituto, cellula discoidali longiuscula, antice latiore et valde obliquata. Abdomen (♀) a basi sua fere usque ad medium segmenti sexti sensim leviter dilatatum, marginibus lateralibus hujus segmenti mox ante medium rotundato-angulatis, deinde fortiter convergentibus. Femora antica posticis paullo breviora, hæc articulo primo antennarum sat multo breviora. Long. ♀ 18·5 mm.

In size and colour, and in the shape of the abdomen, this species much resembles *E. kandyensis*, Dist., but the first antennal joint is longer, the pronotum is not mottled with ochraceous pile but evenly and not very densely sericeous the hemelytra are longer, and the lateral borders of the abdomen alternately coloured with fuscous and whitish.

On *Kandyensis* Distant founded the genus *Lanca*, which is a plain synonym of *Epidaus*, Stäl. Distant (Rhynch. Brit. Ind. II., p. 365) cites *Pnirsus*, Stäl, in conformity with Stäl's arrangement, as a subgenus of *Endochus*, but gives "disk of posterior lobe [of pronotum] unarmed" as a character of this genus, having apparently overlooked that the posterior pronotal lobe in the subgenus *Pnirsus* is armed with two discal spines. As a matter of fact *Endochus* contains in Distant's work only species without discal spines on the pronotum, and it is therefore possible that some or all of the new species described by him as belonging to *Epidaus* really belong to the subgenus *Pnirsus* of *Endochus*, as understood by Stäl. The genera *Endochus* (incl. *Pnirsus*) and *Epidaus* were distinguished by Stäl almost only by the structure of the scutellum, but this is variable to some extent in these genera. Distant's generic apportionment of the species of *Epidaus* and *Eudochus* seems to me to be more natural than that of Stäl, and

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Pnirsus ought to be regarded as a subgenus of *Epidaus*, not of *Endochus*. These groups should be distinguished in the following way.

A. Posterior lobe of pronotum with two discal spines.—*Epidaus*, Stäl.

a. Scutellum a little raised toward the apex which is narrowly rounded.—Subg. *Epidaus* (s. str.)

b. Scutellum not raised toward the apex which is acute or angular. —Subg. *Pnirsus*.

B. Posterior lobe of pronotum without discal spines.—*Endochus*, Stäl.

The difference in the structure of the scutellum of the two subgenera of *Epidaus* is not in all species a very marked one, and they could possibly be united, although the tubercle behind the antennæ usually is less acute and spinelike in *Epidaus* proper than in *Pnirsus*.—*Villanovanus*, Dist., is not even subgenerically distinct from *Endochus*.

46. *Rhinocoris fuscipes*, Fabr.

*47. *Rhinocoris cruralis*, n. sp.

Parce pilosus, sordide testaceus, parte postoculari laterali et superiore capitis (exceptis macula transversa inter ocellos lineaque media ab illa usque ad basin emissa), pectore medio atque abdomine nigris, gula fulvo-sanguinea, lobo antico pronoti piceo-testaceo, membrana fusca, macula subquadrata angulorum apicalium segmentorum abdominis albida, ventre intra spiracula transversim obsolete luteo-maculato ; antennæ ferrugineo-testaceæ, annulo angusto subapicali articuli primi nigro et summo apice ejus albo, articulis duobus ultimis fuscis ; rostrum et pedes obscure ferrugineo-sanguinea, articulo ultimo illius, coxis trochante-ribusque nigris, femoribus subtus infuscatis. Caput pronoto medio paullulo longius, parte postoculari quam anteoculari paullulo breviore, e supero visa basin versus sensim angustata, articulo primo antennarum capite paullulo breviore, supra parce piloso, pilis granulis minutis insidentibus, articulo secundo primo plus quam dimidio breviore, tertio secundo subæque longo articulo primo rostri parti anteoculari capitis subæque longo. sedundo premio paullo longiore. Pronotum latitudine basali hemelytrorum parum latius, impressione media lobi antici usque ultra medium lobi postici extensa, ad basin lobi antici plica nulla transvera interrupta, tuberculo angulorum apicalium parvo, subacuto, angulis lateralibus rotundatis, basalibus breviter lobatis. Scutellum summo apice fortiter recurvum. Hemelytra apicem abdominis paullum superantia, corio præsertim in venis concoliter sericeo. Pleuræ ochreo-sericeæ. Abdomen hemelytris clausis sat multo latius, spiraculis post medium segmentorum sitis. Tibiæ posticæ medio per partem circiter quintam logitudinis earum paullo incrassatæ, parte incrassata in latere infero-interiore dense adpresse albo-sericea. Long. ♀ 11 mm.

This remarkable species has no other near ally than *Rh. longifrons*, Stäl. upon which Stäl founded the subgenus *Charontus*. It differs from that species by the shorter basal antennal joint and second rostral joint, the non-compressed but on its interior under-side densely sericeous incrassated part of the hind tibiæ, and by the different colouring. By the lack of the fold separating the median impression of the anterior pronotal lobe from the transverse impression it differs from the genus *Rhinocoris*, but it has so much in common with *Rh. longifrons* that it cannot be placed in *Sphedanolestes*, from which it differs in the robust (though not large) stature and the quite dissimilar *facies*.—In his Indian Fauna Distant has published an abridged translation of the description of *Rh. longifrons*, but has omitted its principal specific and subgeneric character, by which it differs from all previously known species, *viz.*, the remarkable structure of the hind tibiæ.

* 48. *Glymmatophora segnis*, n. sp.

Levissime subnitida, nigra, dorso abdominis opaco cum connexivo et margine laterali ventris rufo, sed figura magna T-formi nigra a basi ejus

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usque in basin segmenti penultimi extensa signato, area magna ovali media ventris a basi segmenti secundi ad medium sexti extensa sanguinea. Caput transversim rugosum, clypeo prominente, prope basin rotundato-angulato, lamina squamiformi genarum limbo obscure lutescente, tumulo ocellifero leviter elevato sed lato, articulo primo antennarum capite quarta parte breviore, supra parum sed subtus sat dense erecte piloso, articulis tribus subsequentibus dense breviter pilosis et praeterea pilis parcis longis exsertis præditis, secundo primo tertia parte longiore, tertio quam secundo fere dimidio breviore et quam quarto nonnihil longiore (art. duo ultimi desunt). Pronotum latitudine sua paullulo brevius, læve, loboantico quam postico paullo latiore et duplo longiore, angulis apicalibus late rotundatis tuberculo destitutis, marginibus lateralibus obtusissime convexis. Scutellum basin abdominis paullulum superans, medio longitudinaliter impressum. Hemelytra etiam maris rudimentaria, squamiformia, medium scutelli paullum superantia, margine obscure lutescentia. Meso-et metasternum coalita, non sutura sed tantum impressione subtili discreta, parte mesosternali media late sed haud profunde excavata, parte metasternali tumido-convexa et insuper elevatione media longitudinali subcariniformi abbreviata instructo. Latera meso-et metapleuræ e supero distinguenda. Abdomen supra (margine laterali connexivi et segmento secundo dorsi exceptis) transversim rugosum, lorso præterea (segmentis primo, sexto septimoque exceptis) utrinque longitudinaliter impresso, ventre lævi, segmento Primo medio longitudinaliter rugoso, margine basali segmentorum quattuor mediorum, lateribus exceptis dense breviter carinulato-crenulatis, segmento sexto maris ante marginem apicalem impressione curvata sat profunda medio interrupta instructo, segmento genitali maris longitudine paullo latiore, stylis genitalibus apicem impressum et truncatum versus dilatatis. Femora antica subtus prope medium dente gemino, femora media ibidem dente simplice et magis apicem versus dente gemino, femora postica nonnihil ante apicem dente simplice armata: fossa spongiosa tibiarum anteriorum trientem earum occupans. Long. ♂ 23 mm.

Not easily confounded with any previously described species. Belongs, as the other Asiatic species, to the subgenus *Hæmatorrhophus*. As recently shown by Horváth, *Glymmatophora* is generically distinct from *Ectrichodia* Lep. Serv. (*Physorhynchus* Am. S.)

49. *Pirates mundulus*, Stæl.

50. *Lestomerus affinis*, Serv.

Apterous female: Anterior lobe of pronotum scarcely narrower than posterior lobe and three times longer than it. Scutellum reaching base of abdomen. Hemelytra rudimentary, as long as the scutellum, without membrane but with the clavus separated from the corium by a distinct suture.

* 51. *Lestomerus Wroughtoni*, n. sp.

Ventre nitido excepto subopacus, niger, capite superne, rostro, lobo antico pronoti, limbo basali lobi hujus postici, vitta obliqua sublaterali hunc limbum cum margine apicali lobi conjungente pedibusque (coxis exceptis) ferrugineo-testaceis, femoribus medio infuscatis, parte plus quam dimidia apicali clavi, macula magna oblonga adjacente corii maculaque parva triangulari ad marginem basalem membranæ paullo ante angulum apicalem corii dilute ochraceis, macula hac membranæ extus paullo ultra apicem corii lineariter retrorsum producta, connexivo supra et subtus luteo-ochraceo; totus cum rostro et pedibus sat longe et dense ochreo-sericeus, sed scutello, clavo ac corio (locis pallidis exceptis) breviter erecte nigro-pilosis, femoribus anterioribus subtus dense breviter erecte villosis. Caput apice pronoti paullulo latius et apice prosterni angustius, vertice oculo duplo et dimidio latiore, oculis quam parte postoculari haud magis prominulis, e supero visis latitudine

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multo longioribus, ocellis inter se et ab oculis subæque longe remotis; (antennæ desunt). Pronotum subæque longum ac latum, lobo antico lineis nonnullis angustis lævigatis sat obsoletis prædito, impressione ejus media subtili, e basi ad medium extensa. Scutellum apice horizontale, breviter productum. Hemelytra apicem dorsi abdominis attingentia, cellula interiore membranæ apicem acutum versus subsensim angustata. Femora antica fortiter incrassata, subtus spinulis nonnullis in tomento suboccultis armata; femora media modice incrassata, subtus inermia. Fossa spongiosa tibiarum anteriorum paullo minus quam dimidium earum occupans. Long. ♀ 14 mm.

Seems to be more related to *L. sanctus*, Fabr., than to any other described species, but it is very distinct from that species in the narrower head, narrower and much less prominent eyes, apically acute (not truncate) inner cell of membrane, unarmed middle femora, and quite different coloration of most parts of the body.

52. *Ectomocoris quadriguttatus*, Fabr.

53. *Ectomocoris cyaneus*, Stäl.

Of this splendid species only the single type specimen from "India" was hitherto known. It seems to be somewhat variable in colour. In the specimen found by Mr. Wroughton the whole apical third of the clavous is white, the adjacent white spot of the corium is much larger than in the type, the middle femora are dark ferruginous above (except at apex), the hind tibiæ are fuscous toward the apex, and all tarsi are darker. The connexivum has both above and beneath a whitish spot at the base of each segment. These spots are not mentioned by Stæl and Distant, but are probably present also in the type.

* 54. *Tapinus Reuteri*, Bergr.

55. *Acanthaspis quinquespinosa*, Fabr.

* 56. *Pasiropsis nigerrima*, Bergr.

57. *Oncocephalus philippinus* Leth., Bull. Soc. Ent. Fr. 1877, p. 101; Reuter, Acta Soc. Sc. Fenn. XII, 717, pl. II, fig. 29 (1883).

This species, though not common, seems to be widely spread in southern Asia. It is not mentioned by Distant in his Indian Fauna, but is possibly one of the many species of which his so-called "*O. annulipes*, Stäl" is made up. Stäl founded his *annulipes* on a single specimen from Natal, and Reuter has shown in his Monograph that no other specimen of it has yet been found. Stäl later confounded several other forms with it, recording it (1874) from Sierra Leone, China, the Philippine Islands, Australia, and New Caledonia; but these specimens respectively belong to *O. fuscescens*, *scutellaris*, *assimilis*, *confusus*, and *curvispina*, all described by Reuter. Distant has again recorded *annulipes* from different parts of Africa and Asia, and from New Guinea, but the size given by him—"14 to 24 millim"—is sufficient to show that *annulipes* Dist. nec Stäl includes many different species.

* 58. *Bagauda avidus*, Bergr.

Fam. Nabididæ.

59. *Nabis flavomaculatus*, Leth.

60. *Reduviolus*, sp.

A species of the subgenus *Stenonabis*, possibly belonging to *R. nigrescens* Dist.; though not quite agreeing with the description.

Fam. Miridæ.

61. *Lucitanus punctatus*, Kirby.

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Fam. GERRIDÆ.

* 62. *Onychotrechus sakuntala*, Kirk.

The specimens are intermediate between this form and *O. rhexenor*, Kirk., which must be united, as suggested by Distant. Mr. Wroughton found both the winged and the apterous form. The latter is coloured almost as the same form of *O. vadda*, Dist., but the second antennal joint is much longer than the third, the middle femora are a trifle shorter than the posterior ones, and the slightly curved setiform apical appendage of the middle and hind tarsi—a formation well represented by Mr. Distant's drawer in a detail-figure of *O. vadda*, but not mentioned in Kirkaldy's and Distant's descriptions—is shorter, more slender, and not fimbriated toward the base. This tarsal appendage is lacking in the allied genus *Eotrechus*, Kirk., but occurs, more or less modified, in some other genera of Gerridæ. The claws in the species of *Eotrechus* and *Onychotrechus* are very dissimilar to those of the other Gerrids, being long and rather stout, evenly curved in *Eotrechus*, straight and only apically curved in *Onychotrechus*, in both genera provided with long free arolia. It might be inferred *a priori* that their habits are different from those of the other Gerrids, and from a very interesting observation made by Mr. E. E. Green in Ceylon there can in fact be no doubt that they do not live on the surface of ponds or streams like the other "water-striders." He found *Onychotrechus vadda* "on perpendicular rocks with trickle of water: going in pairs, not actually *in coitu*, but the male clinging on back of female." These insects could certainly not climb precipitous wet cliffs with claws constructed as in the other Gerridæ, least of all with a burden on their back.

Fam. BELOSTOMATIDÆ.

63. *Sphærodema rustica*, Fabr.

Suborder HOMOPTERA.

Fam. FULGORIDÆ.

*64. *Putala maculata* Dist.

Fam. CERCOPIDÆ.

*65. *Cosmoscarta relata* Dist.

Fam. MEMBRACIDÆ.

66. *Leptocentrus taurus* Fabr.

Some specimens agree better with *L. substitutus*, Walk., but the differences between these two species are so slight that I think they cannot be separated.

Fam. PSYLLIDÆ.

67. *Diaphorina guttulata*, Leth., Proc. Asiat. Soc. Bengal 1890, p. 165.

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PROGRESS OF THE MAMMAL SURVEY.

It was reported in the last number that all of our original four Collectors had gone home to the War and that Mr. S. H. Prater, Head Museum Collector, was collecting in Sind for the Survey. On account of the climatic conditions, and as it was impossible to get any assistance from the natives at that time of the year, Mr. Prater returned in May, bringing with him a collection of 1,000 specimens which we have no doubt will prove very interesting when worked out. He first collected at Jacobabad, then Kashmer, Sukkur, Khairpur and South to Larkana and while waiting for his steamer at Karachi he picked up a few specimens there. The collection, though rather weak in some of the smaller rodents and bats, is a most useful one and Mr. Prater's success in obtaining it is largely due to the help which was given him by Mr. D. Healy, D. S. P., Jacobabad ; Mr. G. A. Shillidy, D. S. P., Larkana; Mr. W. T. Kirkpatrick, D. S. P., Sukkur; Mr. C. S. Campbell, I.C.S., Collector, Sukkur; Mr. J. R. Martin, I.C.S., Dy. Commissioner, Jacobabad, and H. H. The Mir of Khairpur.

When Mr. Crump finished Sikkim he left behind him a skinner, N. A. Baptista, with Mr. H. Stevens and a nice collection of 200 specimens, several of which Mr. Crump had not obtained, was sent in sometime ago. In the beginning of July, Baptista moved on to Pashok where Mr. R. S. Lister has promised to look after him and help in obtaining specimens. To both of these two gentlemen, Mr. H. Stevens and Mr. R. S. Lister, the Society is much indebted and without their help it would have been impossible to have kept a man in Sikkim.

As was mentioned in our last report on the progess of the Survey, the Society has obtained the services of Mr. R. Shunker Narayan Pillay to work in Travancore and S. India. One small collection has so far been received from Mr. Pillay and another is expected shortly which will, we hope, contain some of the rarer species confined to S. India.

It is with great regret that we have to report the death of Capt. S. A. Macmillan in France on May 9th from wounds received while leading his men into action. Capt. Macmillan served in the Boer War in the Gordon Highlanders Militia and after being wounded received a commission in the regular army. On the Gordon Highlanders being sent to India, Macmillan went with them and later served with the Malay States Guides for four years. On retiring from the army a few years ago Capt. Macmillan started rubber planting and it was while thus engaged that Mr. G. C. Shortridge met him. He accompanied Mr. Shortridge during his Chindwin

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trip, which yielded such wonderful results and is being reported on in the next number of the Journal. On the outbreak of War both Shortridge and Macmillan hurried down to Bombay keen to get to the front. Fortunately places were found for them as Orderlies on a General's staff and before long both received Commissions, Macmillan in the 58th Rifles. Capt. Macmillan was a son of Principal Macmillan, late of the Elphinstone College, and was educated at St. Paul's for which School he won the Public Schools Middle Weight Boxing Championship in 1900.

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REVIEW

SOME SOUTH INDIAN INSECTS.

Such is the title of the latest book published on general Indian Entomology. It is the third on the subject that has come to our notice of late years dealing with that subject. The first was Lefroy's *Indian Insect Life*, a masterly work and the only one of its kind existing at the time it appeared. The other is Stebbing's *Indian Forest Insects*, a review of which will be found in the last number of our Journal. The only fault we had to note in Lefroy's book was its size. It should have been published in two volumes of ordinary dimensions like, say, the volumes of the *Fauna of British India* series. It was presented to the public in one great, unwieldy tome. Such large, heavy books go to pieces by their own weight when carried about and are altogether unsuitable for travelling. All publications with which Government have anything to do seem to be too cumbersome and are thereby badly handicapped in their usefulness. There may be some advantage gained by size as the figure plates can be made to contain more figures as many more can usually be put into a large plate than into a small one, and the price and number of the plates can thus be considerably reduced; but it seems to us that, if size interferes with usefulness, surely cost should be a matter of secondary importance, especially to Government.

The present volume is also too large. The binding and the print are good and the illustrations and figures are generally quite up to the mark. The "original" figures are well chosen as explanatory of the text and are, as concerns the insects particularly, very true to nature. The limacod larva on page 411 is, however, wooden and sausage-like; the woodpecker on page 225 and the parroquet on page 229 might have come out of a Noah's ark and the black and white reproduction opposite the last is hardly artistic. In the coloured plates, the figure of *Parnara mathias* bears little resemblance to the real butterfly (Pl. *b.*); it is much more like an *Iambrix*.

Some South Indian Insects is published under the auspices of the Madras Government and is written by Mr. T. Bainbridge Fletcher, R.N., now Imperial Entomologist to the Government of India. Mr. Fletcher tells us in the preface that he wrote it mainly to place on record information gathered while he was engaged in overhauling the collections and records formed before and during his tenure of the office of Entomologist to the Government of Madras. He says it is not intended to be a text book, but he hopes it may serve as a basis for further work.

It is a good thing to record information on particular subjects in accessible form in one place at all times and especially is this the case when that information is reliable, based upon facts and gathered together by an expert in the matter treated. The value is further enhanced when that expert writes himself and has the gift of expressing himself clearly and to the point as in the present case. Mr. Fletcher has produced an interesting and eminently well written book, the result of his work and experience in India. Notwithstanding what he states, his idea has evidently been, at least partly, to supply an elementary Treatise on Entomology for the Madras Presidency and he has made an attempt, in as short and concise a manner as possible, to carry it out, so that beginners might learn something about each aspect of the subject without the necessity of going to other books of a more technical character. And he has succeeded, we venture to think, very fairly well in the endeavour.

The first nine chapters, all very short, treat of Entomology generally and the Structure, Nomenclature and Metamorphosis of Insects find a place in

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the first three. These are followed by others on Means of Defence, Communication, Relations with Plants, Symbiosis and Parasitism and Tropisms. We think all these would have been unnecessary if the idea of some sort of text-book had not existed, for all the information contained therein could have been got elsewhere and much more fully, though perhaps not quite so pleasantly put and with illustrations and explanations drawn from the Indian fauna. In chapters X and XI we come to the "economical" part of the subject: they deal with the importance of Insect Pests generally and their Control. Further on, going more into detail, these Pests are considered under certain divisions such as Caterpillar Pests, Crickets, Grasshoppers and Termites, Bug Pests, Beetle Pests, Fly Pests, Household Pests, Pests of Stored Products, each having a separate chapter. Then we get a chapter on Insects in connection with Disease, one on Insects directly useful to Man, one on Insect Parasites and Predators and, finally, one on "Some Other Animals" in which we find mention of mammals, birds, fishes, reptiles and frogs, &c., that are known to be helpful or harmful to man and his possessions. Chapter XI is the longest and most important as embodying more particularly the author's experience in the field--for it is one of the Government Entomologist's first duties to collect data about methods and devise means for the prevention or palliation of insect attacks on crops. He has a good deal to say on the subject and points out that little can be done in the absence of a knowledge of the insect in question and a more or less complete acquaintance with its life history. And it is just here that knowledge is wanting and every addition to what we have is of importance. Hence to facilitate future work and acquaint us with what has already been done by others, and to let us know the enemies of particular crops and help us to recognize them, we are given lists, to finish up with, of the common crops with the insects attacking each; of plants allied to each other and likely, therefore, to have the same or a similar enemy and of the insects themselves in systematic order with pictures of each insect and directions how to deal with them.

There is nothing to criticize in the subject-matter of this book, there is little, even, offering occasion for remark; the latter, presumably, because each chapter is necessarily very short and general. We are interested, however, to learn that the habits and early stages of some Indian *Mylabridæ* are known at last. We are told that the larvæ of *Gnathospastoides rouxi*, Cast. (page 302) and *Zonabris*, sp. (looks like *sidæ* from the picture, page 304) feed upon the egg-masses of the Deccan Grasshopper. The life histories are evidently the same as of those of allied European species that have been studied at home. Which explains why some species of *Zonabris* are generally so plentiful in grass lands in this country where they have been noticed, often in company with other members of the family, about the month of September in Bombay, when they occur in great numbers, and all in one place. But the discovery will sorely trouble some growers of roses and other ornamental flowering plants, the flowers of which these beetles devour with great avidity. We might mention that *Platypria hystrix* (page 316) commonly breeds upon *Zizyphus rugosa*, the "torn" or "churn" of Bombay. In Bombay, also, all beetles of the genera *Aspidomorpha*, *Coptocycla*, *Metriona* (pages 317, 318) feed upon convolvulaceous plants. From personal experience we are nearly certain that *Batocera rubus* (page 324) or any other longicorn beetle, no matter what its size, does not take more than the one year to go through all its changes. *Stibara* (page 327) attacks species of *Argyreia*, a convolvulaceous creeper and breeds in its stems. We can corroborate the statement as to how *Pangonia* (page 361) bites, also from personal experience; and the bite is somewhat painful. The larvæ of *Asura conferta* (page 367) and another (probably *hilaris*) feed

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only upon lichens in Bombay ; the former on rocks, walls, &c., the latter under and in decaying damp or wet wood. *Tarache catena* (page 382) :—It will probably be found that *Calotropis* is not a foodplant of the larva of this moth ; it must be a mistake ; plants of the genus *Hibiscus* are, we know, the common food. The larva is of the common *Tarache* type, that is a semi-looper with the prolegs on segments 7, 8 wanting ; it has segments 3, 4 somewhat tumid, especially when sitting highly looped with the front part of the body in the air as it is fond of doing ; it is prettily coloured in cloudings of grey and brown and red, varying in shade, the ventrum and sides being brown, red-rusty or nearly black. It rests along dead bits of stick, &c., and always near or on the ground when not feeding, stretched full length, except for a slight loop at segments 5, 6. It ascends the plant to feed on the young leaves at night or in dull weather. *Remiglia undata* (page 388) :—The larva of this feeds upon species of *Cassia* and, as far as we are aware, only on the small ones such as *kleinii*. *Dasychira mendosa* (page 396) has the following history :—The eggs are laid in masses covered with the fluff from the end of the abdomen of the wingless, or next to wingless, female, in crevices of the tree-trunk, &c. The young larvæ, on emerging, are covered with long hair and get wafted about by the wind and so distributed. Considering the moth is so common, it is a curious fact that the female attracts but few males in captivity. The larva feeds upon practically any broad-leafed tree. The common foodplant of *Cricula trifenestrata* (page 406) in Bombay is *Careya arborea*, one of the *Myrtaceæ*. *Stauropus alternus* (page 408) feeds upon many trees. *Virachola isocrates* larvæ feed also inside the fruits of *Gardenia* and *Randia*, and even *Strychnos nuxvomica*. *Parnara colaca* (page 418) :—The life-history will be found at page 60 of Vol. XI of this Journal. Perhaps the commonest foodplant of the larva of *Suastus gremius* is the wild *Phœnix* or date palm. It feeds, however, upon all palms. *Udaspes folus* (page 420) only feeds upon members of the family *Scitamineæ* ; *Alpinia* belongs to this family. And so on.

A LIST OF BRITISH BIRDS.

In 1883 the British Ornithologist Union published a list of British Birds which was compiled by a Committee of the Union, but in spite of the many changes since that date no new edition of the list was brought out till the early spring of the present year.

To call the work a list is really rather a misnomer as it is a great deal more than a mere list. Under each species is given a short synonym, the derivation of the scientific name, distribution in the British Isles and a general distribution, while at the end of the book there is an appendix giving reasons for the changing or retaining of certain scientific names.

The principal interest in this "List" is naturally centred round the much discussed question of nomenclature and the Committee have, it appears, tried to steer a middle course, not going so far as the Authors of the "*British Birds*" List but at the same time making a number of changes so as to bring the nomenclature of British birds into line with that of more recent writers. They have refused however to change the names of certain well known species, though they admit that according to strict priority these names ought to be changed. A list of these names entitled "Nomina concervanda" is to be found in Appendix II together with the corresponding names under the Rules of Nomenclature as drawn up by the International Congress of Zoology.

The trend nowadays seems to be to mass different genera together but we notice the Committee have not made many changes in this respect.

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In the first edition of the " List " 376 birds were given as British while in the present edition the numbers have been brought up to 475 and out of these 188 are regular breeding birds while 286 do not nest in the British Isles and one, the great Auk, is extinct.

At the end of the recognised British species is an appendix in which is given the names, together with a few remarks, of all birds which have been recorded as found in the British Isles, but which in the opinion of the Committee cannot be admitted for want of satisfactory evidence. These include a number of well-known Indian species such as the Blue-tailed Bee-eater, *Merops philiphinus*, Indian Roller, *Coracias benghalensis*, and Bar-headed goose, *Anser indicus*, which must have either escaped from captivity or else some mistake must have been made over the labelling of the specimen.

The List is printed the same size and style as the *Ibis* and the Committee are to be congratulated on the way they have completed their task, a task in which it would be difficult to please all Ornithologists.

(A List of British Birds compiled by a Committee of the British Ornithologists Union, Second and Revised edition, sold by Messrs. William Wesley & Son, London, 1915, price 7/6.)

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MISCELLANEOUS NOTES.

No. I.—WEIGHTS AND MEASUREMENTS OF GAME ANIMALS.

The weights of animals marked* were taken with a 300 lbs. Salter's spring balance which was tested before and after use and found accurate: other weights were taken with a similar balance of 200 lbs. capacity.

CHAKRATA, *14th May* 1915.

R. W. BURTON, LT.-COL., Indian Army.

Species.	Locality.	Sex.	Date.	Weight in lbs.	Length.	Tail.	Chest.	Neck.	Forearm.	Skull.	Candal Vertebra.
Tiger, *Felis tigris**	Godavari Dist. ..	*M*	22-12-12	416	9′-9″	36″	52″	23·5″	21″	14″×9·5″	..
Panther, *Felis pardus** ..	,, ,, ..	*M*	5-1-13	106	6′-9″	33″	29·75″	19·5″	10·75″	8·37″×5·75″	26
,, ,, ,, * ..	,, ,, ..	*M*	7-2-13	(an old beast. all sutures of the skull completely closed.) 72	6′-7″	36″	..	..	..	8″×5″	..
,, ,, ,, * ..	,, ,, ..	*F*	8-2-13	60	5′-10″	29″	..	..	..	7·56″×4·87″	..
,, ,, ,, * ..	Bijinur Dist., U.P.	*M*	9-11-12	114	6′-11″	29″	30″	..	..	9·25″×5·81″	..
,, ,, ,, ...	Chakrata Hills ..	*M*	29-3-15	105	..	..	..	..	..	8·62″×5·5″	28
,, ,, ,, ...	,, ,, ..	*M*	28-7-15	115	7′-11″	25″	..	16″	11″	....	27
,, ,, ,, ...	,, ,, ..	*M*	4-8-14	75	(three quarters grown animal)					7·62″×4·75″	..
,, ,, ,, * ..	Bijinur Dist., U.P..	*F*	7-11-12	86	6′-4″	30·5″	..	..	..	8·25″×5″	25
Sloth Bear, *Melursus ursinus**.	Godavari Dist. ..	*F*	29-12-12	124	5′-3″	(an old beast.)					
Himalayan Black Bear. *Ursus torquatus.**	Chakrata Hills ..	*F*	9-6-14	105	(full grown, had produced cubs.)						
,, ,, ,, ..	,, ,, ..	*F*	6-8-14	65	(about two years old.)						
,, ,, ,, ..	,, ,, ..	*M*	6-11-14	381	6′-2″	..	48″	23″	18″	11·87″×7·75″	..
Jungle Cat, *Felis affinis* ..	,, ,, ..	*F*	12-8-14	13	5′-3″	10″	(in very poor condition and should have weighed more).			....	..
Jackal, *Canis indicus* * ..	Bijinur Dist., U.P..	*M*	11-11-14	21	..	..	..	..	..	....	..
Hill Fox, *Vulpes montanus* ..	Chakrata Hills ..	*M*	28-10-14	8½	..	..	..	..	..	....	..
,, ,, ,, ..	,, ,, ..	*F*	28-10-14	6¼	..	..	..	..	..	....	..
Indian Scaly Anteater, *Manis crassicaudata.*	.....	*M*	30-12-10	29	3′-10″	22″	(centre of fore claw foot 3·5″, tongue 14″)				

Species.	Locality.	Sex.	Date.	Weight in lbs.	Nose to root of tail.	Tail.	Girth.	Height.	Foreleg below elbow.	Cannon bone.	Right horn.	Left horn.	Tip to tip across forehead.	Girth of horns.	Widest span.	REMARKS.
Indian Buffalo, *Bubalis bubalis.* *	Godavari District.	*M*	7-1-13	2,001	108″	32″	101″	67″	22″	11″	48″	56″	108″	17″	57	The weight was as follows:—4 legs cut off at knee 50 lbs., head and neck 245 lbs., skin (remainder) 185 lbs., 2 forelegs 226 lbs., 2 hindlegs 240 lbs., stomach and contents 340 lbs., entrails 120 lbs., remainder 511 lbs., wastage blood, &c., 40 lbs.
,, ,, ..	,, ,, ..	*M*	16-1-13	..	112″	..	..	68·5″	23″	11″	42·5″	41·5″	95″	18″	45·25	Weight not taken but a larger and heavier beast than the first one. I judged him to be 240 lbs. heavier than the other.
Chital, *Axis axis*..	,, ,, ..	*M*	31-1-13	206	..	..	..	..	..	..	..	..	..	..	..	
Goral, *Nemorhœdus goral.*	Chakrata Hills.	*M*	19-10-14	62	..	..	..	..	..	..	7·25″	7·25″	..	..	..	
,, ,, ..	,, ,, ..	*F*	30-10-14	60	..	..	..	..	..	..	..	..	..		..	

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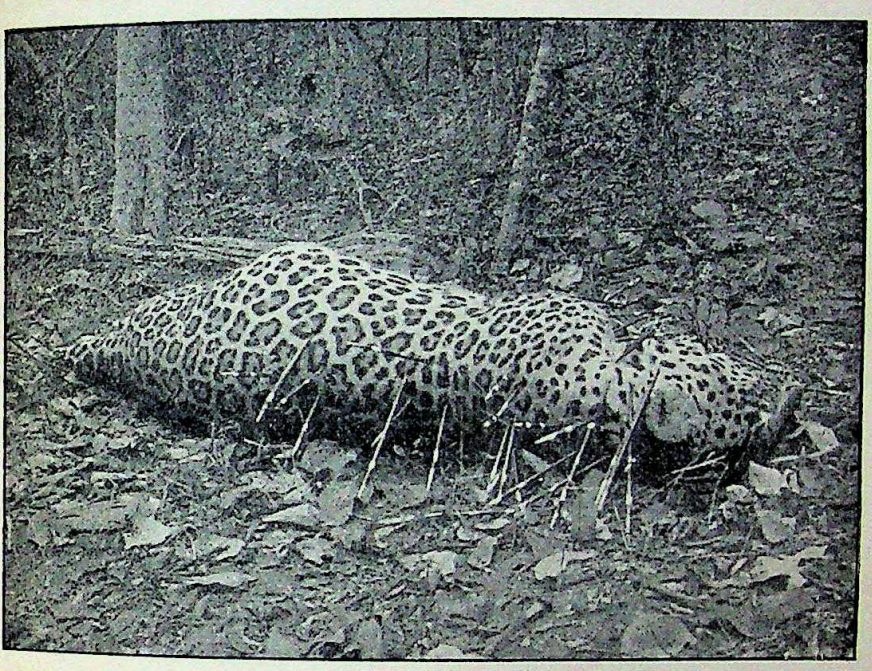
No. II.—A PORCUPINE ATTACKING A DEAD PANTHER.

(*With a block.*)



On 8th April I shot a panther over a kill at about 7-30 P.M. The brute dashed off about 100 yards where I heard what I took to be its death groan. Half a minute or so later I heard a guttural sound twice repeated; which I could only put down to the panther, though it was unlike anything I had heard before; in fact I put it down to the panther bringing up some of the meat he had eaten.

As it was dark I left the panther for the night, and on returning in the morning found it lying dead (where I had heard the death groan) and bristling with porcupine quills.

There was a row of quills from the back of the head down to the middle of the back and a lot more in the chest, neck and forearm of the panther, also one in the very tip of its nose.

It was clear that the porcupine had attacked the panther after it was dead. Had the panther made any movement some of the quills would have been displaced, whereas the only quills in the ground were half-a-dozen firmly stuck in, obviously by the porcupine while attacking the panther. Over five dozen quills were picked out of the panther and it was noteworthy that they had all been fired at vital parts of its body.

The guttural sound which I had heard the previous night may have been the cry of the porcupine, a sound with which I am not acquainted. The dying rush of the panther may have carried it close to the porcupine and led it to think that it was being attacked. The deliberate way in which

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the porcupine had walked round its adversary and filled him with quills both before and behind was most interesting, and it probably went off quite convinced that it had killed the panther single-handed!

It would be interesting to know if this incident can be paralleled.

The panther was a full-grown male, 7 feet in length. Of the two photos enclosed, that giving the back view was taken just as the panther lay when found, the other was taken after the panther had been moved.

H. H. F. M. TYLER, I.C.S.

ADYAR GATE,
MADRAS, *27th May* 1915.

No. III.—HAIR BALL FROM THE STOMACH OF A NILGAI.

Through the kindness of Mr. D. O. Witt the Society has received a large hair ball taken from the stomach of a "nilgai". This ball, which was one of several, is 20 ins. circumference, and weighs $2\frac{3}{4}$ lbs. It is practically a perfect globe and in colour is brownish, very similar to a kind of linoleum having also the smooth surface. It has been thought worth while to reproduce the following note from the "Indian Forester" which gives the history of this hair ball.

N. B. KINNEAR.

Bombay Natural History Society Museum,
July 1915.

DEATH OF A NILGAI FROM EATING HAIR.

"On the 20th March 1909, a tame blue-bull or "nilgai" (*Portax pictus*) died at the age of three years. On being cut up, eight dusty-brown coloured balls were found in its stomach. These balls were brought to me as a curiosity. They were like cannon-balls in appearance and were so hard and stiff that they could not be broken or even flattened with a hammer. I then had one of them sawn in two, and found that it was composed of a compact mass of hair, probably human hair, surrounded by a leathery outer covering. It is surprising where the animal could have found so much hair, and the only explanation seems to be that, as it used to roam freely wherever it liked in the village, it used to lick up the human hair thrown away by barbers. In fact, some of the villagers afterwards stated that they had seen the animal doing this.

Four of these balls were from 19 to 21 inches in circumference, and weighed from 2 to $2\frac{1}{2}$ lbs., while the remaining four were 13 to 15 inches in circumference, and weighed over half-a-pound. The shikaris around here say that they have never heard of any such instance before. It would appear that death was caused by this great accumulation of hair which the animal was unable to digest, but the wonder is that it lived long enough to accumulate such a mass."

RAGHUBIR SARAN MITAL,
Range Officer.

DEORI, C. P.,
14th May 1909.

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No. IV.—THE NILGIRI WILD GOAT (*HEMITRAGUS HYLOCRIUS*, JERDON).

It is usually considered that a buck Nilgiri goat that has once gained his "saddle" never loses it again. No mention is made by Jerdon, "Vagrant" (A. C. McMaster), Douglas Hamilton, or in the "Fauna" of its being a seasonal feature. My own experience is far too limited to entitle me to an opinion, but I would mention that in one locality abounding with "ibex" I have seen only one "saddle-back" in March or April of four consecutive years. At that season I have seen a number of very dark and evidently fully matured bucks that had no "saddle" distinguishable at a short distance. Most of those shot at that time seen by me had not the saddle mark very prominent.

Towards the end of May and up to January many "saddle-backs" are to be seen in the same locality.

Those familiar with this animal in the Nilgiris only will not allow that the "saddle" disappears at any season. On the other hand, planters with ample opportunity for observation in the Annamalai Hills (both in British territory and in the Travancore State) have informed me that they have not the slightest doubt that if the mark does not disappear entirely, at least it becomes so faint as to be indistinguishable except at very close quarters.

I trust that members who have had experience will be good enough to place their observations on record in these pages.

With regard to the size of herds, I recently counted 86 in one, and there were a few more individuals lying hidden from me behind a spur and which I only saw when I showed myself and put the herd to flight. The total must have been just about 100.

C. E. C. FISCHER.

COIMBATORE, 1*st June* 1915.

No. V.—NOTE ON A WAGTAIL NEW TO THE INDIAN LIST.

At the Meeting of the British Ornithologists Club on 10th February 1915, Dr. C. B. Ticehurst exhibited a male specimen of the very rare wagtail, *Motacilla flava leucocephala* (Przew.), obtained by Mr. Hugh Whistter on the 2nd of May, 1913, at Jhelum in the Punjab, and made the following remarks :—

"This race, which is remarkable for the head, cheeks, earcoverts, and chin being pure white, was described in 1887 by Przewalski (Zapuski Imper. Akad, Nank. St. Petersburg, lv. 1887, p. 85, and noticed in "The Ibis" for 1887, p. 409) from specimens obtained during the spring migration on the River Irtisch and in the Southern Altai, Dzungaria. Apparently no other specimens have been obtained until this single bird was procured over 1,000 miles south-west of the type-locality. The breeding quarters and winter quarters of *M. f. leucocephala* are unknown. The bird secured was probably only a straggler to the Punjab, as Mr. Whistler, who has always kept a sharp look-out for wagtails, tells me it was the only one of its kind seen, and was on migration in company with many *M. f. beema* (Sykes). The breeding quarters are doubtless further north than the Altai Range, and are perhaps in the valleys at the source of the river Yenesei. I have not been able to compare this bird with the type, but Dr. Hartest, who has

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kindly examined the specimen, tells me it corresponds exactly with the plate given in 'Aves Przewalskiana,' i. pl. x, figs. 3 and 4. Since only a few specimens are known, the question naturally arises whether this is not an aberration? I think it is not; firstly, Przewalski apparently obtained more than one specimen in the same district, and, secondly, the white of the head does not look to me like albinism, as it shades off into the grey of the neck. I exhibit for comparison males in similar plumage of *Motacilla f. flava, M. f. beema, M. f. rari, M. f. thunbergi,* and *M. f. melanogrisens.* (Bull. Brit. Orn. Club, xxxv, p. 1.)

No. VI.—SOME BIRDS IN HISSAR DISTRICT, PUNJAB.

The following notes on some birds observed in the Hissar District of the Punjab may prove of interest.

The Bristled Grass-Warbler, *Chaetornis locustelloides* (Blyth). Two specimens were obtained in the Cattle Farm Bir at Hissar (1418 ♂ 30-7-1914; 1419 ♀ 1-8-1914). The male had the testes rather enlarged, while the female had a slight incubation patch and a well-developed egg in the ovary. These birds were not a pair for they were met with in localities some distance apart, but both were frequenting the same type of ground, namely, bush jungle filled with heavy grass and other herbage. This ground is the habitat of great numbers of the Common Babbler (*Argya caudata*) which the Bristled Grass-Warbler greatly resembles, so probably other specimens of the latter were missed. The species has not been previously recorded from the Punjab.

The Thick-billed Flower Pecker. *Piprisoma squalidum* (Burton).

Oates remarks (Fauna. B. I. II, p. 383) that the western limits of this species are difficult to define owing to want of specimens and records of occurrence. It is said to be very common at Baroda, and then there is a great gap up to Etawah and another up to Dehra. Hence it is worth recording that I obtained a couple of specimens in my compound at Sirsa; both were females and were obtained on 11-1-1915 and 4-2-1915 respectively. In behaviour and appearance they were similar to a *Phylloscopus* or *Lorterops,* but my attention was attracted by the distinctive note; the shape of the bill also rather catches the eye.

The Dessert Warbler, *Sylvia nana,* (Hemfu and Ehreb.)

This interesting little bird was found to be very common in January in the area about Chantala and Dabwali towards the Bikanir border; an odd bird or two were seen as far as Pipli, but none were actually noted at Sirsa which is given as a locality for the species by Oates. All the above places, however, are in the Sirsa sub-division. The country in these parts consists of a wide, level plain of sandy soil, highly cultivated with corn and chiefly gram, a certain amount of mustard being mixed with the other crops. Here the Desert-Warbler was common, creeping about in the growing crops, or in the bushes on the patches of fallow ground studded with leek and wild caper. It is fairly bold in demeanour, perching on the top of a wild caper bush (for preference) and allowing a near approach before flying off low over the ground, or threading its way into the tangled interior of the bush.

It also settles freely on the ground, running with agility over the open or under the cover of a bush. By the casual observer it may pass unnoticed easily, as being perhaps *Franklinia buchanani,* which it somewhat resembles in appearance (when not in the hand) and habits; save that it is a solitary bird. For so small a species this warbler is extraordinarily tough

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and hard to secure, a second cartridge being often necessary. Hence I found the obtaining of good specimens somewhat of a difficulty.

Stoliczka's Bush-Chat. *Pratincola macrorhyncha*, Stoliczka.

Found to be not uncommon during the winter, being met with on various dates between 19th November and 10th March. It is somewhat local and was observed only at Ranian, Sahuwala, and Rori, all places in the Sirsa sub-division. It has the ordinary habits of a *Pratincola*, but frequents pieces of waste sandy ground, studded with low scrubby patches of thorn. It may be distinguished from the other Chats found in the same area by its very light colour, which gives it a whitish appearance.

The Black-crowned Finch lark. *Pyrrhulauda melanauchen* (Cab.).

Several were noted during the last week of January haunting a patch of waste sandy ground by cultivation at Chantala in the Sirsa sub-division. They were apparently thinking of breeding as the cocks were indulging in what was doubtless a courting display—mounting up into the air, and there rising and falling on the wing, uttering meanwhile a somewhat monotonous note. The species have not before been recorded in the Punjab anywhere between Muttra and Jhelum district.

The Black-throated Thrush. *Merula atrigularis* (Temm.).

One was seen in my compound at Sirsa on 26th November; I shot a male in the same place on 8th February, at the same time hearing another individual's call. These birds probably were in the neighbourhood all the winter as on several occasions I thought I heard the call of the species.

Hodgson's Pipit. *Anthus rosaceus*, Hodgs.

On the 13th January at Sirsa I found a number of these handsome pipits feeding on the ground amongst the long, weedy grass which clothes the old ballast pits at the side of the railway embankment; most of the pits either contained a little water or had only recently dried up, so that the floor of the pits was mostly mud; on this mud, generally near the water, the pipits were feeding. They were not shy, rising singly only a few yards in front of me to fly in a hovering manner a short way into the air before settling again or else flying low over the grass and on to the ground again a short way ahead. Once or twice an odd bird was seen to settle on a tree, and one that I fired at and wounded perched on some of the reedy grass after the manner of a Blue-throat. I did not find any in these pits either before or after that date.

The White-capped Bunting. *Emberiza stewarti*, Blyth.

A male was obtained at Sirsa on 10th November.

The Eastern Meadow Bunting *Emberiza stracheyi*, Moore.

A fairly common winter visitor, usually found in small parties in bush-jungle, noted on various dates, both at Hissar and in the Sirsa sub-division, from 19th November until 18th March.

The Large Pintail Sandgrouse. *Pteroclurus alchata* (Linn.)

A single male was found amongst a bag of Imperial Sandgrouse (*Pterocles arenarius*) shot by a party at Hansi on January 21st. This was the only one of its kind obtained in the district during the season as far as I could find out.

HUGH WHISTLER, M.B.O.U.,
Indian Police.

GUJRANWALA, PUNJAB,
15*th April* 1915.

No. VII.—SEVEN KOEL'S EGGS IN ONE NEST.

On 16th May 1915 an orderly produced two eggs which he said he had taken out of a crow's nest from a clutch of seven. They were of two

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distinct types, one measuring 1·3″ × ·96″ and being marked with brown on an olive green background while the other measured 1·25″ × 97″ and was bluish-green in ground colour. The orderly explained that there were five of the first type and two of the second. I went to see the nest, and as I approached the crow left it. Unfortunately it was built high up on a very slender branch, inaccessible to any but a light and agile climber, and I made no attempt to reach it, but I have no reason whatever to doubt the man's veracity. I sent him up again on the 26th when he reported that all the eggs of the first type had hatched out, but not the remaining one of the second type.

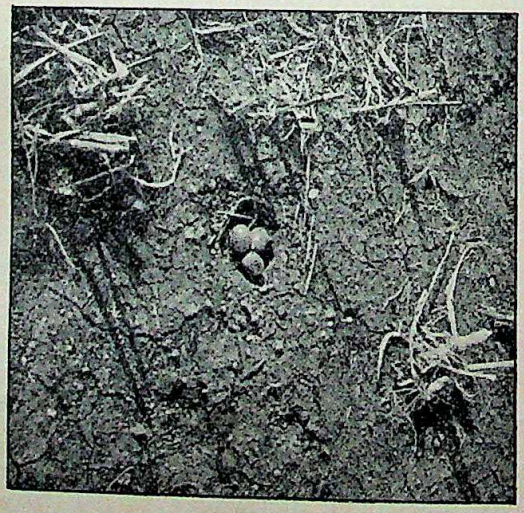
J. R. JACOB.

DHARWAR;
13*th June* 1915.

[From Mr. Jacob's note, and after seeing two of the eggs, it is evident that two different koels had deposited their eggs in the crow's nest. Four is the largest number of eggs of a koel which have been recorded as found in one nest, but members who have any notes on the number of koel's eggs might send them in for publication—EDS.]

No. VIII.—NEST OF COMMON SAND-GROUSE.

The enclosed photographs of the nest of the Common Sand-grouse may be of interest. The nest is nothing but a very small depression in the ground, and was possibly formed by the hoof of a bullock. There is no sort of lining or attempt at construction, the eggs, three in number, being laid on the bare soil.



It was in the middle of a field of jowari stubble, and I used to pass it on foot or horseback nearly every day, and although knowing to within a

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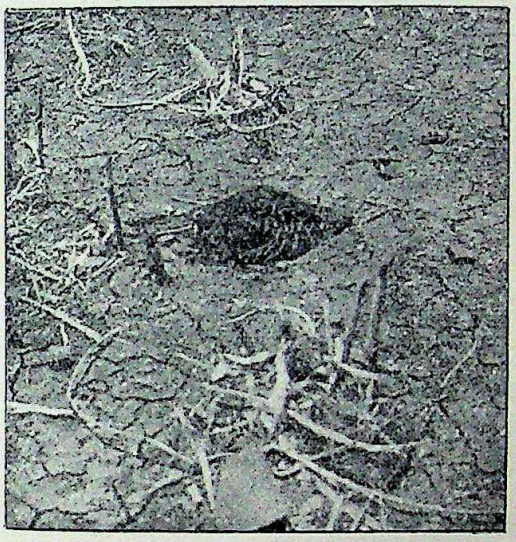
couple of feet where it was, it nearly always took me some moments to locate it, so exactly did the sitting bird resemble the face of the ground on which she was sitting, crouched low and with feathers spread to meet the earth all round her nearly flat. In no state of the sun did she throw the slightest shadow.



When she began sitting I do not know, but I watched her almost daily from about the 10th to the 27th April, when the photographs were taken, and a few days later there was a single addled egg in the nest, so that, presumably, she hatched out two chicks about the 28th. She had got so accustomed to me and the horse that she never left the nest, and after a few trials of approach, I took the camera and was able camera in hand to take photographs of her on the nest at eight feet from the lens.

I never saw the cock bird sitting, nor did I see him about the nest at any time. The hen used to leave the nest between 6 and 7 a.m. to feed every morning, but whether she left again in the evening I was unable to discover. The snap gives a very good idea of the invisibility of the bird in her surroundings.

C. BEADON.

CAMP MASKI, DECCAN.
25th May 1915.

No. IX.—*ERYX CONICUS* BREEDING IN CAPTIVITY.

With the intention of elucidating the breeding habits of this snake, a pair of adults was confined together in the vivaria of the Nagpur Museum

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in July 1914. No results were apparent last year, and in the meantime Captain Gharpurey's Note on the breeding habits of this snake appeared in Vol. XXIII, No. 2, of this Journal, showing that the species was viviparous.

The pair, nevertheless, was kept together, and early in June 1915 the female became somewhat restless and was noticed to be making attempts to get out of the cage. On the afternoon of the 9th June it voided seven young, but on the following morning five had disappeared and had probably been swallowed by another female snake of the same species which had temporarily been confined in the same cage. The two remaining hatchlings measured 8·1 and 8·3 inches respectively. One of them sloughed on the 15th June.

E. A. D'ABREU, F.Z.S.,
Assistant Curator.

CENTRAL MUSEUM, NAGPUR,
22nd June 1915.

No. X.—*DRYOPHIS DISPAR* (GUNTH).

The specimen was secured in grass land at an elevation of about eight thousand feet on the Annaimalai Hills on the 29th April 1915. On dissection it was found to be a gravid female containing, besides a number of undeveloped eggs, four fully-formed young; these would have been born very shortly. Evidently the snake is viviparous.

The young were a very dark grey green almost black, and measured eight inches in length.

C. E. C. FISCHER.

COIMBATORE,
1st June 1915.

No. XI.—THE HABITS OF *RANA SEMIPALMATA*, BOUL.

On the 1st of May 1915 in the Annaimalai Hill I made the following note of the above named frog :—

The music of this little frog is peculiar and is accompanied by a curious physical phenomenon. The skin below the throat is capable of extraordinary expansion, and during the song is blown out into a bladder nearly as large as the rest of the animal. There are no signs of this potentiality when the beast is in repose or dead. The frog is arboreal.

The song is uttered generally during the night, but may be heard during the hours of daylight in the dense shade of evergreen forest.

The song begins with a series of timed, metallic, squeak-like notes very like the noise made by pressing the bottom plate of the small German tin toy-frogs. While these single notes are being produced the gular skin is being gradually inflated. When the bladder has been fully distended into a thin semi-transparent membrane the full song begins. This sounds like the rapid drumming of the finger-nails on a thin tin plate (from about 8 to 20 or more strokes) ending with one to four spaced strokes. This is repeated at very short intervals *ad infinitum*, one frog answering another. The membrane remains at full distension throughout.

C. E. C. FISCHER.

COIMBATORE,
1st June 1915.

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No. XII.—NOTES ON THE RESPIRATION OF THE MURRAL (*OPHIOCEPHALIDÆ*).

In describing the murral on page 233 of the "Rod in India" (3rd Edition, 1897), Mr. Thomas writes as follows:—

"They may be seen coming up to the surface continually, exhaling a bubble and taking in a mouthful of fresh air, and they have an air cavity for the storage of the fresh air. If confined in a globe or other vessel with a net stretched across a little below the surface of the water, so as to prevent them from breathing the atmospheric air direct, they will die from not being able to oxygenate their blood, however fully supplied with oxygen the water may be."

For the last four years I have made somewhat inchoate observations on the habits of murral. One result of these in brief is the conclusion, that the auxiliary breathing apparatus of the family Ophiocephalidæ is, as Mr. Thomas observes, indispensable, and that the fish will die directly its breathing is confined to the use of its gill filaments, but *only in certain conditions of the water in which it is living.* In October 1912, for instance, a number of murral were caught in running water at a temperature of about 78° F. at Dinanagar in the Punjab. They were at that time rising to the surface continually in order to inhale the outer air. They were transferred to a rock-hewn tank at the top of a hill in Nurpur Fort some thirty miles away. Here at first they continued to rise to the surface, but as the winter drew on and the water temperature in the tank fell to 50° F. and below they ceased to rise altogether. It was certain that they could not have escaped, and subsequent observations showed that they were all there, yet the surface never shewed a "rise." In the summer they were rising as merrily as ever. But in the following winter they went down again and remained at the bottom as did their progeny, for they bred freely.

Meanwhile, on 23rd November 1913, two murral were placed in a live car in running water: they were placed at the bottom of a pool about six feet deep in such a manner that they could not rise to within three feet of the surface. The fish were respectively 18″ and 12″ long. They were left at the bottom 24 hours and were perfectly well at the end of the experiment.

Since then I have had many proofs that murral need not come to the surface provided that the water is sufficiently cold. It is fairly certain, however, that Mr. Thomas and other Madras observers have never had to deal with the fish in water cold enough to render them independent of the air cavity. Hitherto all observations have been made in waters so warm as to make the fish absolutely dependent on this store of surplus oxygen which needs constant replenishment if it is to be drawn upon: and the conclusion, that unless it could rise to the surface, it would die, "however fully supplied with oxygen the water may be", was perfectly legitimate and natural.

Nevertheless, I believe that the air cavity is only an auxiliary apparatus to be called into use when the supply of oxygen obtainable through the gills is insufficient, and that this characteristic has only escaped notice because observations have never been made in waters, like those of the Punjab, whose low temperature in winter enables them to absorb large quantities of oxygen by atmospheric pressure.

The fact that water will absorb oxygen and nitrogen, in other words will become "saturated with air" when it is exposed to the atmosphere, is well known. Not all field naturalists are aware that the degree of absorption varies in inverse ratio to the temperature. Roughly speaking, one litre of

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water at freezing point (0° C., 32°F.) will at normal atmospheric pressure absorb 19·33 c.c. of nitrogen and 10·18 c.c. of oxygen: as the temperature rises to 20° C. absorption falls to 12·8 c.c. nitrogen and 6·35 of oxygen.

Certain species of fish of course will not survive in water above a given temperature. Brown trout, for instance, will die in sluggish, shallow water at 70° F. But they will survive comfortably at 72° and over if that water is surcharged with oxygen either with a pump, or by increasing the flow. In other words, the temperature of water affects fish mainly because a high temperature means a deficiency of oxygen. And this explains the fact that it is only with a high temperature that the murrals are compelled to call their air cavities into use.

The writer has had no opportunity for systematic experiment and tabulation of results. But enough has been written to show that a most fascinating field of experiment awaits exploitation. For instance:—

1. Place a murral in a tank minimum temperature 80° F. Time the rises for one hour. Raise and lower temperature and note results on the timing.
2. Prevent fish from rising to the surface at 80° F.: note what period passes before he dies.
3. Prevent fish from rising to surface at 80° F.
   (i) Pump known quantity of oxygen into water and note effect on fish's vitality.
   (ii) Lower temperature and note point at which fish ceases to show signs of distress.

Apart from their scientific interest these experiments will have a practical value. As Mr. Wilson has shown in Madras, *murral*—one of the best food fishes in Indian waters—are peculiarly adapted to simple methods of pond culture, the main difficulty in connection with them being—in the Punjab at any rate—to prevent their escape during the rains, when they develop most migratory habits. But I know by experience the bitter disappointment of visiting a recently stocked tank to find no sign of the rings indicating that the fish are still "at home." It will be a great comfort to be able to produce a pocket thermometer and by its aid to decide that the fish are at home indeed, but not rising. At present we do not know the degree of cold which will enable the species to do without its supply of outer air.

G. C. L. HOWELL, F.Z.S.,

Director of Fisheries, Punjab.

15th May 1915.

No. XIII.—NOTES ON CISSITES.

Ent. Mo. Mag., Oct. 1902, p. 232.—"On recently opening up a dead tree extensively tunnelled by *Xylocopa tenuiscapa*, I found the galleries infested by numerous examples of the large red Meloid beetle, *Cissites debeyi*, Fairm., in all stages. It is said that in Europe beetles of this family deposit their eggs on, or in, the ground, and that the young triungulin larvæ attach themselves to some passing bee by which they are introduced into the nest where they undergo their remarkable hyper-metamorphosis. In the case of *C. debeyi* this procedure does not appear to be carried out. I found masses of the eggs actually in the galleries of the bee, all hatching out into the

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characteristic triungulins. The eggs were deposited at the ends of the galleries, and each mass must have contained several thousand individuals. The full-grown larvæ of the beetle excavate for themselves offshoots from the tunnel of the bee, of a much smaller diameter and an inch or more in length, in which they pupate. The fact that the young larvæ are hatched inside the nest of the bee suggests that at least some of them may pass their whole larval existence on the spot; but they are produced in such vast numbers that for most of them a migration must be necessary. They are doubtless unconsciously transported to fresh colonies by the bees themselves. I have frequently captured specimens of *Xylocopa* bearing examples of the triungulins attached to their hairy legs. On one occasion I found a single triungulin on the stamens of a large blue *Thunbergia*, the blossoms of which are frequented by the *Xylocopa*. It is noticeable that the male bees are more constantly utilized by the triungulins than the females."

No. XIV.—KUMAUN BUTTERFLIES.

Addenda to list of Kumaun Butterflies published in Vol. XX of the Journal, p. 130.

Argynnis altissima mackinnoni, de N.—A single specimen in the British Museum taken by J. F. Duthie and labelled "Kumaun 15-7-86".

Listeria dudgeoni, de N.—A specimen in the British Museum taken at or near Ranikhet in 1909 by the Rev. H. Menzies.

Hesperia cashmirensis.—Mentioned by Watson as having been taken in Kumaun by Doherty (Hesp. Indicae, p. 50).

Coladenia tissa.—Two in my collection from Jinli at about 2,000 ft. in September.

Pamphila avanti, de N.—A single specimen taken in July 1909 on the Niti Pass, 15,000 ft., by a native catcher, and now in my collection.

These bring the total of forms recorded in Kumaun up to 378.

F. HANNYNGTON, F.Z.S.

MERCARA, COORG,
28th June 1915.

No. XV.—LOCUSTS IN NORTH BENGAL.

The Dooars is the country which is situated under the Himalayas in the District of Jalpaiguri. It is an extension of the Terai which is to the west. The rainfall is very large, and varies from 120 to perhaps 250 inches.

On Thursday, the 8th July, a great swarm of locusts arrived, apparently from the south or south-east. Tea gardens from a distance of ten miles away report that all were visited by millions of the insects. The locusts arrived about 4 P.M. and stopped until 1 P.M. on the following day and sometimes longer. They attacked the nitrogenous shade trees and green crops—*Albizzia stipulata*—*Tephrosia candida* and such like, and did considerable damage. Fortunately, however, the tea was not badly damaged, only young, soft leaves here and there having been eaten. The locusts may have occupied even a larger extent of country than the 10 to 12 miles in width of which I am at present informed.

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After staying about 16 to 24 hours the large majority cleared away to the north, leaving a number of stragglers here and there.

Locusts have never been known to visit this country before, and I report the occurrence since it seems extraordinary that they should visit a district of heavy rainfall such as this is.

W. LANCELOT TRAVERS.

BARADIGHI S. E., JALPAIGURI,
10*th July* 1915.

No. XVI.—"CHEMOTROPISM, INFLUENCE OF KUSUM OIL ON INSECTS."

Everyone is familiar with the smell that some bugs emit. This odour is due to the secretion of a fluid from special glands located in different places in the body of insects which are known by various names such as Oderiferous glands, Stink glands, Scent glands. This fluid may be disagreeable or sweet in its smell, may serve as a means of defence against enemies, may act as an attraction for opposite sex, and fulfil many other purposes.

In the case of young nymphs in Rhynchota, these glands are situated on the abdomen, while in the case of adults they are located on either side of the metathorax and are covered over by the wings.

During winter of the year 1913 Mr. Puran Singh, Chemical Adviser to the Forest Research Institute, while dealing with kusum (*Schleichera trijuga*) oil, noticed a species of insect in and near his laboratory. He, thinking that it might be of some interest to me, kindly gave me this information, adding that the oil attracted these insects. After a careful search it was ascertained that the insects were not breeding in the laboratory but were attracted there by something, probably by the smell of the kusum oil, and it was considered interesting to study the peculiar fascination (if any) the bug had for the oil.

It was first thought that there was some similarity in the smell of this oil to the smell emitted by the fluid from the stink glands of the female bugs, and it was for this reason that the male bugs only were attracted to the oil in numbers. On subsequent careful examination of the insects present near the oil, and conducting the experiment at different places in Dehra Dun, it was evidenced that it was not one particular sex only that came near the oil, but both the sexes in all their stages of development were seen on and near the oil. So it goes clearly to show that it is not the male only that is carried to the oil by its similarity in smell to the fluid from the stink glands of the female, but that the oil has a chemotropic influence on both sexes of the bug. That the bug is led blindly to follow the line of diffusion of the smell of the oil is beyond doubt, and I believe that a psychological reaction is produced on the insect by the oil, which compels it to go to the oil, in much the same way as a moth follows a ray of light to its source.

One can within a few hours catch a large number of males, females, and nymphs, even very small ones, by sprinkling a few drops of the oil on a sheet of paper, stone or any other suitable object. It has been observed that the nearer the oil is to the insects the larger is the catch. The above has a bearing on the rate of "attraction," which depends also on the direction in which the wind is blowing. I have within a course of seven days caught about 3,000 of these bugs (males, females and nymphs) from different localities in Dehra Dun of which I give below a list with dates :—

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Dehra Dun, 1913.

Locality.	28th Nov.	29th Nov.	1st Dec.	2nd Dec.	3rd Dec.	5th Dec.	11th Dec.	Grand total.
No. A ..	39	43	59	70	67	89	112	479
„ B ..	23	49	51	62	70	69	80	404
„ C ..	45	39	42	53	81	102	101	463
„ D ..	27	46	54	66	56	77	83	409
„ E ..	30	41	47	59	83	92	74	426
„ F ..	39	52	48	57	72	56	67	391
„ G ..	41	39	43	53	89	80	91	436
Totals ..	244	309	344	420	518	565	608	3,008

N.B.—Localities A—G were selected places in Dehra Dun where insects were seen in plenty.

The experiments were carried out in November and December during a period when the eggs were hatching and the larvæ were passing through their different moults, but if this bait were utilised during the time when the insects are most plentiful, I hope the above number would be much raised. Mr. F. M. Howlett of the Agricultural Research Institute, Pusa, in his paper on the Psychology of Insects,* comes to the conclusion that insects are to be regarded "not as intelligent beings consciously shaping a path through life, but as being in a sort of hypnotic trance, and when they are a pest it is no intelligent foe we have to fight, but a mere batallion of somnambulists." The bug on which kusum oil plays such an important part is *Serinetha augur*, Fab., a member of the family *Coriedæ*, sub-family *Corizinæ*. Hitherto this bug is not known as a pest to crops in India as informed by Mr. A. J. Grove, Supernumerary Entomologist, Agricultural Research Institute, Pusa, to whom my best thanks are due for the identification of this bug as well. I think it would be interesting to make further observations to see if this oil has similar fascination to any crop pests in India or elsewhere, for it would then be an easy matter to fight with it by means of the kusum oil, just as in the paper above mentioned, Prof. Howlett has tried to contend with fruit flies using citronella as the bait.

DEHRA DUN,
8th May 1915.

N. C. CHATTERJEE, B. SC.,
Assistant to Forest Zoologist.

* Read before the General Malarial Committee at Madras in November 1912.

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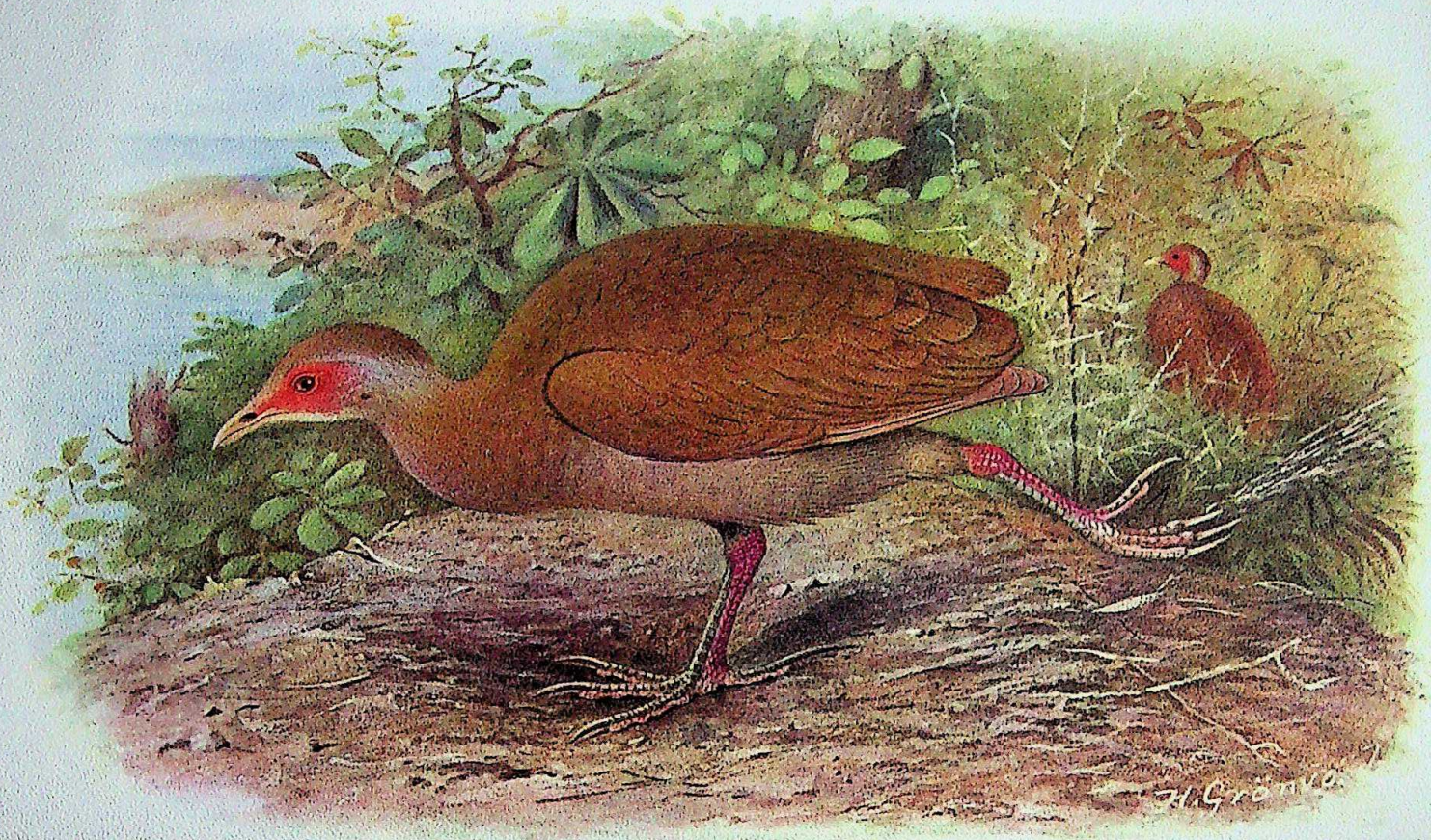

Megapodius nicobariensis.
THE NICOBAR MEGAPODE.

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NOTICE.

The coloured illustration of the Nicobar Megapode (*Megapodius nicobariensis*) now published was omitted from the last number of the Journal—No. 1, Vol. XXIV.

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BY

E. C. STUART BAKER.

The publication of the next Volume of the above in book has been suspended until the end of the War, as so many subscribers are away on active service.

Due notice will be given when publication is intended.

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The new Edition of Major Wall's "**Poisonous Terrestrial Snakes of our British Indian Dominions (including Ceylon) and how to recognize them,**" with text figures, is still obtainable from the Society. This edition has been enlarged and brought up to date and a second part has been added giving a full account of the action and treatment of the poisons of different snakes.

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Nemopsis nuchorensis.
The Nicobar Medusoids.

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JANY. 1916. VOL. XXIV. No. 2.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART XVIII.

With Plate.

Sub-family—ARGUSIANINÆ.

The present sub-family consists of birds of grey plumage with occellations of metallic colour, brilliant in the male but sometimes duller or absent in the female. The tail feathers vary in number from 12 to 24.

The sides of the head and face are more or less naked; the tarsus is sometimes spurred with one or more spurs, sometimes without any. The general character of the plumage is very soft and lax.

According to Beebe all the genera of this sub-family moult their tail feathers commencing with the third from the central pair and proceeding thence outwards and inwards simultaneously.

KEY TO GENERA.

Secondaries longer than primaries; tail feathers 12 ...*Argusianus*.
Secondaries no longer than primaries; tail feathers from 20 to 24 in number ... ...*Polyplectron*.

Genus—*ARGUSIANUS*.

The genus *Argus* is distinguished from all other Indian Game Birds in having the secondaries longer than the primaries; in the male bird the former being practically twice the length of the latter. The genus *Rheinardtius* is very closely allied to *Argusianus* but is not represented within our limits. In *Argusianus* the central tail feathers are nearly twice the length of the next pair, the remaining pairs being graduated, whilst in *Polyplectron* all the feathers are graduated.

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Three species of this genus have been admitted hitherto, *i.e.*, *argus*, *grayi* and *bipunctatus*, but the last is named from a single feather which appears to me to be nothing more than an abnormal primary feather of *argus*. The two webs of this feather both spring from practically the same source, *i.e.*, the extreme upper edge of the vane instead of from the two sides, consequently both webs derive their pigmentation from the same source and have the same colouration. Under the circumstances the species must undoubtedly be suppressed. The origin of the feather is not known but it was named by a Mr. Wood, who gave it to Mr. Bartlett who in turn made it over to the British Museum. It is probably an abnormal wing feather of a captive bird.

ARGUSIANUS ARGUS (Linn).

The Argus Pheasant.

Phasianus argus.—Linn, S. N., I., p. 272 (1766); Lath., Ind. Orn., II., p. 629 (1790).

Argus giganteus.—Temm., Pig. et Gall., II., p. 410 (1813); Gray, List of B., pt. III., Gal. p. 23 (1844); Blyth, Cat. Mus. As. Soc., p. 242 (1849); Elliott, Mon. *Phas.* I., pl. XI (1872); Hume, Str. Feath., II., p. 481 (1874); *id. ibid* III., p. 324 (1875); Hume and Davison *ibid*, VI., p. 427 (1878); Hume and Marsh., Game B., Ind., p. 99 (1878); Hume, Str. Feath., VIII., p. 68 (1879); *id.* Cat. No. 803 ter.

Argus pavonius.—Vieill, N. Dict. d'Hist. Nat., II., 507 (1816).

Argus pavoninus.—J. E. Gray, Ill. Ind. Zool., I., pl. 36 (1830-2).

Argusianus giganteus.—Gray, List Gallinæ Brit. Mus., p. 25 (1867); *id.*, Hand-L. II., p. 257 (1870); Blyth and Wald., Cat. Mamm. and B. of Burmah, p. 148 (1875).

Argusianus argus.—Tweedd, Ibis (1877), p. 322; Oates, B. of Burmah, II., p. 313 (1883); Murray, Avi. B. I., II., p. 530(1890); Ogilvie-Grant, Cat. B. M., XXII., p. 363 (1893); *id.*, Game B., II. p. 70 (1897); Blanford, F. B. I. Birds, IV., p. 71 (1898); Oates, Man. Game B. of Ind., I., p. 286 (1898); Butler, Birds Larut Hills, p. 22 (1899); Sharpe, Hand-L., I., p. 41 (1899); Oates, Eggs of B. B. M., I., p. 61 (1901); Finn, Indian Sport Birds, p. 167 (1914).

Vernacular names.—Quou, Borong Quou, Kwang (*Malay*); Kyek or Kyet-wah (*Siamese, Bankasoon*).

Description—Adult Male.—Centre of crown from forehead to nape, black, the feathers of the latter rather longer, forming an incipient crest; feathers of the back of the neck sparse and barred black and white, the latter changing to rufous towards the back. Sides of head and all round the eye, chin, throat and sides of the neck nearly bare with fine shaft-like feathers scattered thinly over the whole surface. Upper back, scapulars and wing coverts blackish

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brown spotted, barred and edged with buff and dark rufous; lower back, rump, and shorter tail coverts rufous buff very finely edged and boldly spotted with black, the tail coverts palest and dullest; longest and outer tail coverts white, densely covered with kidney-shaped spots of black centred buff. Primaries purple-grey, changing to buff on the innermost, freely spotted with kidney-shaped spots like those on the tail coverts, most numerous on the outer webs and bases; on the inner webs there is a broad line of pale rufous or cinnamon densely covered with minute white specks; this line is shortest on the first and longest on the innermost primary, and connecting this band with the shafts throughout their lengths are fine bars of black. The shafts themselves are blue. The outer secondaries are like the primaries, but have broad whitish margins to the inner webs, and the spots on the outer webs are developed into black longitudinal bands; on the outer webs next the shafts, also, there are occelli of iridescent buff, green-grey and purple surrounded with black and with an outermost ring of pale buff; the inner secondaries are without occelli and are mottled black, rufous and brown with white spots, over all of which there is a very faint purple sheen; on all the secondaries there is a broad ill-defined terminal band of deep purple on which the markings are reduced to white spots and specks and faint rufous bars. Central rectrices black shading to rufous chestnut on the edge of the outer web and to pale French grey on the inner web, both webs spotted with white, these spots being smaller and surrounded by black on the outer webs; tips dull white. Remaining tail-feathers blackish, spotted and speckled with white and mottled indistinctly.

Below, from upper breast to vent rufous chestnut, dotted with black and white on the foreneck, and mottled and barred with black elsewhere; centre of vent dull unmarked ashy.

Colours of soft parts.—Iris brown, hazel or greenish brown; legs and feet red, varying in tint from dull crimson pink to vivid scarlet red; claws pale bluish horny; bill light bluish horny; bare skin of head and neck dull pale slate to blue-grey or bluish lead colour.

> "Iris greenish hazel, feet pale coral pink, bill whitish horn, skin of head pale cobalt blue." (Robinson.)
>
> "The male has the legs and feet bright red, sometimes even a vermilion red. The female has them a paler and duller red, sometimes a litharge red; the bill and claws are white, slightly tinged blue; the cere, in the male, is the same colour as the bill, in the female pale brown; irides wood to dark brown; the facial skin pale dull indigo to dark plumbeous blue." (Hume.)

Measurements.—Total length from bill to end of longest rectrices about six feet. Wing to end of primaries 17·5″ (444 mm.) to 19·5″ (495 mm.) and to end of secondaries, anything between 30

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and 40 inches (762 and 916 mm.) ; tail to end of central pair of rectrices up to 56″ (1422 mm.), generally in fine adult specimens between 46 and 50 inches (1168 and 1270 mm.) and roughly twice the length of the next pair ; tarsus 4·2″ (105·1 mm.) to 4·5″ (114·3 mm.) ; mid toe and claw about 3·0″ (76·2 mm.); bill at front about 1·4″ (35·5 mm.) and from gape about 1·8″ (45·7 mm.).

"Weight 4·5 to 5·5 lbs." (Hume.)

Adult Female.—From forehead to nape dull rufous buff, the feathers broadly edged black, especially in the centre, where the black forms an indistinct coronal streak ; a full crest of bristly dark grey feathers ; nape bright rufous chestnut with faint dark vermiculations at the bases of the feathers ; on the mantle the chestnut becomes less bright and the vermiculations more numerous ; the upper back scapulars and wing coverts about equally black and chestnut, the latter colour paling posteriorly ; lower back, rump and upper tail coverts the same but with definite bars of black mottled with buff ; rectrices purple chestnut thickly mottled with black. Primaries chestnut, lightly speckled with black on both webs, but brighter on the outer than on the inner webs ; secondaries boldly mottled with black and buff, tinged with chestnut on those next the primaries.

Below, chestnut, brightest and almost immaculate on the foreneck, and dullest and inclined to buff on flanks and abdomen, vermiculated with narrow black bars increasing in extent from breast to vent ; under tail coverts dull brown, very finely stippled with dull rufous. The vent is usually like the under tail coverts and the feathers immediately surrounding it are often the same.

Colours of the soft parts.—Iris dark brown ; legs and feet pale vermilion or litharge red ; bill and claws horny white, dull white, or tinged with grey ; cere dull to dark brown ; skin of face and neck dull grey or plumbeous blue to dark blue.

Measurements.—Wing to end of primaries 11·8″ (299·7 mm.) to 13″ (330·2 mm.) and to end of secondaries 14·0″ (355·6 mm.) to 15·5″ (393·7 mm.) ; tail 12″ (304·3 mm.) to 14″ (355·6 mm.); tarsus about 3·75″ (95·2 mm.); mid toe and claw about 2·80″ (71·1 mm.); bill at front about 1·35″ (34·2 mm.) and from gape 1·45″ (36·8 mm.).

"Weight, 3·25 to 3·75 lbs." (Hume.)

Young Male in first plumage.—Like the adult female, but without crest developed as in that sex and with a longer tail.

Chick in first plumage.—Like the female but with a bristly crest undeveloped and dark chestnut brown instead of black. The general tint is more ruddy, and the under plumage more boldly marked, the vermiculations running into definite bars. Even at this stage the inner secondaries exceed the primaries in length.

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Chick in down.—Below rufescent brown, paler on chin and albescent on vent. Above ; forehead plain, rich, rufous brown, head the same, vermiculated with blackish brown ; upper back still darker and lower back and rump velvety blackish brown with two longitudinal broad lines of pale buff extending from the scapulars to the tail ; wing coverts like the upper back, the quills and greater coverts vermiculated rufous and dark brown with well-defined rufous tips and sub-terminal dark bands.

Distribution.—The Malay Peninsular, Sumatra, Siam and the extreme south of Tenasserim. According to Oates and Blanford it is found round about " Bankasoon, Malewcon, and the Upper Pakchan " in the latter district.

Nidification.—There is practically nothing on record about the breeding of this remarkable bird, beyond Davison's oft-quoted note in " Game Birds." He writes:

> " I was unable to find the nest, but from what I could learn, " the female builds a rude nest on the ground in some dense " cane brake, laying seven or eight eggs, white or creamy, " minutely speckled with brown like a turkey's, and hatching " and rearing her brood without any assistance or interference " from the male. They are said to have no regular breeding " season, the females laying at all times except during the " depth of the rains. I secured two nestling about a week old " on the 28th February. "

There is still no evidence on record as to whether the male is polygamous or monogamous, but probably he is neither in the proper meaning of these terms and the sexes only meet intermittently when the female is urged by the procreative instinct to visit the male. At the same time the latter has a most wonderful display which, according to most naturalists, even of the present day, is employed to attract and incite the female, and it may be that though the sexes keep very much apart during the greater part of the day, the males yet have their own particular harem as do many others of the *Phasianidæ*.

The display of the male is very similar to that of the much better known Peacock-Pheasant and is given at least as freely in captivity as in freedom. The normal full display is a frontal one in which the bird sinks its breast slowly to the ground, raises and spreads its tail to the greatest extent possible and at the same time forces the carpal joints of the wings on to the ground whilst it raises the ends of the feathers in a circular fan-shaped manner so that the tail is practically concealed with the exception of the long central rectrices which wave over the centre. Sometimes the bird hides its head and neck amongst the scapulars and feathers of the back, when the general appearance presented is much that of a Japanese feather screen.

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A male in the possession of Routledge in Calcutta, which I saw frequently, never gave this frontal display but would walk round the full extent of his cage, encircling two or three females in the centre and at the same time gradually erecting and spreading his tail; during these perambulations one wing was carried almost perpendicularly over his back, whilst that nearest the female was spread downwards until it touched the ground. Occasionally the bird would stop in its walk and force itself hard up against the wire netting which formed the enclosure and apparently make an effort to still further expand both wings and tail. On several occasions I saw one of the females respond to the male with a minor display after which she approached close to him and squatted on the ground evidently inviting his attentions.

It is probable that Davison's estimate of seven or eight eggs to the clutch may be excessive as one of my collectors was informed that two or three eggs constituted a clutch, and that more than this number was exceptional.

Two eggs laid in confinement in Zoological Society's Gardens are described by Oates as "blunt ovals, smooth and fairly glossy." They are pale reddish buff, freckled with pale reddish brown. In one specimen the freckless are coarse and distributed all over the shell; in the other they are minute and clustered round the two ends.

"The dimensions of two examples are respectively 2·55 by 1·85; 2·6 by 1·9."

I have two eggs in my own collection taken by Waterstradt or one of his collectors which were laid by wild birds. These two eggs, which are of different clutches, vary very considerably. The one is a pale cafè-au-lait, so minutely stippled with a darker shade of the same, that the egg appears almost unicoloured; the other egg is a pale clear cream. Both eggs are very smooth in texture, but not glossy; the grain is fine and close but the shells are fragile for such large eggs. The two measure, respectively, 2·65″ (67·3mm) × 1·67″ (42·4mm) and 2·72″ (69·1mm) × 1·82″ (46·3mm).

Habits.—Although so many years, 36 to be exact, have passed since Davison wrote his most interesting account of this bird's habits, no other description has been written to modify or to contradict it, or to give us a further insight into its habits. He writes:—

> "They live quite solitarily, both males and females. Every "male has his own drawing-room, of which he is excessively "proud, and which he keeps scrupulously clean. They haunt "exclusively the depths of the evergreen forests, and each male "chooses some open level spot, sometimes down in a dark "gloomy ravine, entirely surrounded and shut in by dense cane "brakes and rank vegetation, sometimes on the top of a hill "where the jungle is comparatively open, from which he clears "all the dead leaves and weeds, for a space of six or eight

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"yards square, until nothing but the bare clean earth remains, "and thereafter he keeps this place scrupulously clean, remov- "ing carefully every dead leaf or twig that may happen to fall "on it from the trees above.

"These cleared spaces are undoubtedly used as dancing "grounds, but personally I have never seen a bird dancing in "them, but have always found the proprietor either seated "quietly in, or moving backwards and forwards slowly about "them, calling at short intervals, except in the morning and "evening, when they roam about to feed and drink. The "males are always to be found at home, and they roost at night "on some tree quite close by.

"They are the most difficult birds I know of to approach. "A male is heard calling, and you gradually follow up the "sound, taking care not to make the slightest noise, till at "last the bird calls within a few yards of you, and is only "hidden by the denseness of the intervening foliage. You "creep forward, hardly daring to breathe, and suddenly emerge "on the open space, but the space is empty; the bird has "either caught sight of or heard or smelt you, and has run off "quietly. They will never rise, even when pursued by a dog, "if they can possibly avoid it, but run very swiftly away, "always choosing the densest and most impenetrable part of "the forest to retreat through. When once the cleared space "is discovered, it is merely a work of a little patience to "secure the bird by trapping it. The easiest way is to run "a low fence of cut scrub round the spot, leaving four openings "just sufficiently wide to enable the bird to pass through, and "in these openings to place nooses fastened to the end of a "pliant sapling, which is bent and kept down by a catch. This "is the usual way, and the one I adopted to secure most of my "specimens, as I found it as difficult to shoot as it was easy "to trap them. The natives, however, have other ways of "securing them, all dependent on taking advantage of the birds "idiosyncracy about keeping its home clean.

"One of these plans, which, though I have never actually "seen it in operation, is, I am informed, really practised, is as "follows:— A bit of bamboo, about 18 or 20 inches long, and "a quarter of an inch wide, is shaved down till it is the thick- "ness of writing-paper, the edges being as sharp as a razor. "This narrow pliant piece ends in a stout sort of handle at one "end, 6 or 8 inches long, which is driven firmly into the "ground in the middle of the cleared space.

"The bird, in trying to remove it, scratches and pecks at "it, trying to dig it up, but finding all its efforts vain, it "twists the narrow pliant portion several times round its neck,

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"and taking hold of the bamboo near the ground with its bill, "it gives a sudden spring backwards to try to pull it up; the "consequence is that its head is nearly severed from its body "by the razor-like edges of the bamboo.

"Another method is to erect two small posts, about 4 feet "high and 3 feet apart, in the clearing, across the top of which "a bar is firmly fastened; over this bar a string is run, by one "end of which a heavy block of wood is suspended just under "the bar, while the other end is fastened to a peg lightly "driven into the ground immediately beneath the block. The "bird commencing, as usual, to clear away these obstructions, "soon manages to pull up the peg, and thus releases the heavy "block of wood, which falls and crushes it.

"The males are not at all quarrelsome, and apparently "never interfere with each other, though they will answer each "other's calls. The call of a male sounds like 'how-how,' repeated "ten or a dozen times, and is uttered at short intervals when "the bird is in its clearing, one commencing and others in the "neighbourhood answering. The report of a gun will set every "male within hearing calling, and on the least alarm or excite-"ment, such as a troop of monkeys passing overhead, they call.

"The call of the female is quite distinct, sounding like 'how-"owoo, how-owoo,' the last syllable much prolonged, repeated "ten or a dozen times, but getting more and more rapid until "it ends in a series of 'owoo's' run together. Both the call of "male and female can be heard to an immense distance, that of "the former especially, which can be heard at the distance of a "mile or more. Both sexes have also a note of alarm, a short, "sharp, hoarse bark.

"The female, like the male, lives quite solitary, but she has "no cleared space, and wanders about the forest apparently with-"out any fixed residence. The birds never live in pairs, the "female only visiting the male in his parlour for a short time.

"The food consists chiefly of fallen fruit, which they swallow "whole, especially one about the size and colour of a prune, "which is very abundant in the forests of the South, but they "also eat ants, slugs and insects of various kinds. These birds "all come down to the water to drink about 10 or 11 a.m., "after they have fed and "before they, or at any rate the males, "return to their parlours."

Genus—*POLYPLECTRON.*

The genus Polyplectron consists of pheasants of grey, grey-brown or buff plumage, freely vermiculated or barred with darker, and with metallic coloured ocelli on the tail and wings.

The tail consists of 20 to 24 feathers, the central rectrices greatly

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exceeding the others in length, graduated to the outermost which are the shortest. The inner secondaries are comparatively long though not lengthened as in Argus. The sides of the face are bare; the tarsi have two or more spurs on either leg and the plumage is very soft and lax.

The females are similar to the males but smaller, duller, and in some cases less ornamented with ocelli.

Sharpe admits six species in the genus, including in it Hume's *intermedius*; Ogilvie-Grant admits the same with the exception of that bird. I am doubtful if *napoleonis* should be included in this genus and would exclude it from it, leaving only the five birds which are typical Peacock-Pheasants with ocelli on the upper plumage as well as on the tail. *Napoleonis* seems to form a connecting link between the genera *Polyplectron* and *Chalcurus*.

Within the limits of the present work, we have three forms of Polyplectron, *i.e.*, *bicalcaratum* and *malaccensis*, and a third which is either *germaini* or a closely allied form which will bear Hume's name of *intermedius*.

KEY TO SPECIES.

A.—Crest of short, hairy feathers.
  a. General colour mottled grey ... ... *bicalcaratum.*
  b. General colour mottled dark blackish grey. *germaini.*
B.—Crest of pointed metallic feathers.
  c. General colour mottled buff ... ... *malaccensis.* ♂
C.—No crest and feathers of crown normal
  d. General colour mottled buff ... ... *malaccensis.* ♀

It is rather doubtful whether the species *bicalcaratum* should not be divided into two *subspecies* as the birds from Burmah can be separated at a glance from those of the Bhutan Dooars, Bengal and Western Assam by their much more buff tint, whilst the birds from Eastern Assam, Cachar and Sylhet are intermediate.

If divided, their names would be: *Polyplectron bicalcaratum bicalcaratum* (Müll.) for the Western, and *Polyplectron bicalcaratum chinguis* for the form found in N. E. India and Burmah.

Hartert has shown (in loc cit.) that the "paon de chine" of Edwards and Brisson is really the bird with two ocelli on the tail feathers, and the name *bicalcaratus* which Linnaeus created for this bird is therefore applicable to the form which has been generally known as *chinguis*, whilst the species hitherto known as *bicalcaratus* must bear the name *malaccensis* (Scop.) of 1786.

POLYPLECTRON BICALCARATUM (Müller).

The Grey Peacock-Pheasant.

Pavo bicalcaratus.—Linn., S. Nat., I., p. 268 (1766).
Pavo chinguis.—Müll., Suppl. to Linn. S. N., p. 121 (1776).

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Pavo tibetanus.—Gmel., Sys. Nat., I., pt. II., p. 731 (1788); Lath., Ind. Orn., II., p. 617 (1790).

Pavo bicalcaratus.—Lath., Ind., Orn., II., p. 617 (1790).

Pavo iris.—Bonnat., Tabl. Encl. Méth., I., p. 178, pl. 83 (1792).

Polyplectron chinquis.—Temm., Pig. et Gall., II., p. 363 (1813); Blyth, Cat. Mus. As. Soc., p. 241 (1849); Gould, B. Asia, VII., pl. 50 (1871); Blyth and Wald., Cat. Mamm. & B. Burm., p. 148 (1875); Ogilvie-Grant, Cat. B. B. pit Mus., XXII., p. 354 (1893); Ogilvie-Grant, Game B., II., p. 61 (1897); Pocock, Avi. Mag., 1910-11, p. 229.

Polyplectron albooccellatum.—Cuv. Règ. Anim. ed 2e, I., p. 474 (1829).

Polyplectron cyclospilum.—Gray, List Gallinæ B. M., p. 23 (1867).

Polyplectron atelospilum.—Gray, List Gallinæ B. M., p. 24 (1867).

Polyplectron eniscospilum.—Gray, List Gallinæ B. M., p. 24 (1867).

Polyplectron tibetanum.—Gray, Genera B. III., p. 495 (1845); Elliott, Mon. Phas., I., pl. 6 (1872); Hume and Davison Str. Feath., VI., pp. 432, 521 (1878); Hume and Marsh., Game B. I., p. 105 (1878); Oates, Birds Burm., II., p. 315 (1883).

Polyplectrum tibetanum.—Godwin-Aus., J. A. S. B., XXXIX., pt. II., p. 272; XLV., pt. II., p. 83; Hume, Cat. No. 803 quat. (1879); *id.*, Str. Feath., VIII., p. 68 (1879); Bingh., *ibid*, IX., p. 195 (1880); Fasson, *ibid*, p. 203; Hume, *ibid*, XI., p. 390 (1888); Waddell, Gazet., Sikkim, p. 229 (1888).

Polyplectron bicalcaratus.—Hartert, Nov. Zoo., Vol. IX., p. 539 (1902).

Polyplectron helenæ.—Oates, Ibis, 1883, p. 136; *id.*, B. Burma., II., p. 316 (1883).

Polyplectrum chinquis.—Blan., F. B. I., Birds IV., p. 73 (1893); Oates, Game B., I., p. 233 (1898); Sharpe, Hand-L., I., p. 39 (1899); Stuart-Baker, Jour. B. N. H. Soc., XII., 486 (1899); Inglis, *ibid*, p. 676; Stuart-Baker, *ibid*, XVII., p. 971 (1905); Harington, *ibid*, XIX., p. 309 (1909); *id. ibid*, XX., p. 377 (1910); Venning, *ibid*, XXI., p. 332 (1912); Hopwood, *ibid*, p. 1214 (1912); Gairdner, Jour. N. H. Siam, Vol. I., No. 3, p. 151 (1915).

Vernacular names.—Munnowar, Deodahuk, Deoderrik (*Assamese*); Deo-durrug (*garo*); Deo-dao-dip (*Cachari*); Burruminrui (*Naga*); Katmor (*Chittagong*); Doun-kalak (*Arrakan*); Shwe-dong (*Tenasserim*); Yit (*Burmese*); Wograw (*Kachin*).

Description—Adult Male.—Whole upper plumage grey brown, the grey tint prevailing; the hairy feathers of the crest and nape are finely vermiculated with white and the rest of the upper surface covered with small spots of white, which tend to collect and form indefinite bars on the lower back, rump, and upper tail coverts. The feathers of the mantle, the wing coverts with the exception of the

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Polyplectron bicalcaratum.

THE GREY PEACOCK PHEASANT.

♂ Upper figure. ♀ Lower figure.

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outermost lower coverts, and the inner secondaries with ocelli at their tips of violet green blue, each ocellus surrounded with a narrow brownish black band succeeded by a second broader one of white. Similar ocelli occur on the rectrices in pairs about one inch or rather more from the tip of each feather. These ocelli are much larger than those on the mantle, are oval in shape and far more green, only showing the violent tint under exceptional lights; the outer ring, also, is pale brown, not white.

Below, the chin and throat are white, the white sometimes extending to the foreneck (as in the type of Oates' *helenæ*); remainder of lower plumage like the back, but with the bars more definite on the breast, flanks and upper abdomen. On the under aspect of the tail, the ocelli show through as blackish blots.

Colours of soft parts.—Irides white or pale pearl grey, facial skin yellowish flesh colour, sometimes almost a reddish flesh colour; legs and feet dark slaty or greenish plumbeous to dusky black, the claws black; bill black at the tip and over most of the culmen, base creamy flesh colour, extending over all but the tip of the lower mandible.

Measurements.—Length about 22″ to 26″ (559 to 760 mm.); wing 8″ to 9″ (203 to 228 mm.); average about 8·5″ (216 mm.); tail to end of two central rectrices 12″ to 16″ (304 to 402 mm.); tarsus about 3″ (76·2 mm.); bill at front rather under ·75″ (18·9 mm.); and from gape about 1·3″ (33 mm.).

"Weight 1·4 to 2 lbs." Average weight of full grown cock, about 1·6 lbs.

Very Old Females are practically indistinguishable from the younger, duller coloured males, though they are smaller and have comparatively shorter tails.

Younger Females have the ocelli on the upper parts less brilliant, whilst the surrounding circles of black and white are replaced by broken bars of black and white above and below them. The ocelli on the shorter tail feathers are sometimes absent, but the white spots on the rump and upper tail coverts are bolder, and some of the shafts of the feathers of these parts are also white. The white on the throat generally extends further on to the foreneck than it does in the male. The crest is more developed and more feathery in the female than it is in the male.

Colours of the soft parts.—Irides grey and in quite young birds a grey-brown or deep grey. Facial skin duller flesh colour than in the male. The legs and feet are also paler, generally a dull brownish plumbeous, never black.

Measurements.—The female is considerably smaller than the male. The wing varies from 7″ to 8″ (177 to 203 mm.), the latter very exceptional and the tail seldom exceeds 10″ (254 mm.) and is usually less than this.

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Weight about 1 lb. or rather less.

Young males of about a year old are like the females.

In quite young birds, the whole plumage, especially the quills and coverts of the wings, is much more boldly mottled with buff and white than in the adults.

The ocelli commence to show in the autumn of the first year as blackish spots, then on the longest tail feathers, early acquiring a slight green sheen.

Young in down.—Above, dark chestnut with two faint darker streaks down the sides of the back with broad streaks of yellow buff outside these. Below, the colour is a pale dull buff, rather richer and brighter on the flanks and chin. A dark spot or spots on the wings.

The number of spurs on the tarsus differs in different individuals, and often on the two legs of the same individual. In a few cases I have seen as many as four on either leg, often three and sometimes three on one and two on the other. The females have small blunt spurs, either one or two, and rarely three on each leg.

Distribution.—This Pheasant is found all along the Bhutan Terai, and extends thence throughout the Brahmapootra Valley, both North and South of the River, into the Chin Hills, Arrakan, Pegu, Tennasserim and further East into Siam and the Kachin Hills. It is common throughout the lower broken hills of Sylhet, Cachar, Manipur, Tipperah and Chittagong, and is certainly also found in the West and South-West Lushai Hills. From the North-West I have never been able to obtain any whole skins and, curiously enough, the odd feathers I have obtained (from head-dresses, etc., of the Looshais) were all similar to the tail feathers of *P. germaini*, so that in this part of the country it would appear as if a bird nearer to this latter species replaced *bicalcaratum*. *P. germaini* itself is found in Cochin China, and it would seem impossible for it to occur at so great a distance from this country especially, as we know, other species intervene between the two points.

It is noticeable in a large series of the Grey Peacock-Pheasant, that as one works from the Western limits of its range Eastwards, the birds assume a less grey and more buff or brown tint in their plumage; so much so that it is not difficult to divide the species into three groups. Of these, the birds with the purest grey plumage inhabit the Buxar and Bhutan Dooars, the Darjiling Terai, and Western Assam; the most buff birds will be found in the Chin, Kachin and South Burmah Districts with intermediate birds in the intermediate country of Eastern Assam, Cachar, Sylhet, Chittagong and N. W. Arrakan. Specimens from Siam, however, appear to be nearer the Western form than the Eastern in general tint. With still larger series available for examination it may be found that the difference is sufficiently marked to allow of, or even

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to necessitate their division into subspecies, in which case the Burmese bird would bear the name *P. bicalcaratum chinguis*.

Nidification.—There is very little on record about the nidification of this pheasant in a state of nature, though it has often been successfully bred in captivity. In Cachar, Sylhet, Dibrugarh and other districts of Assam, in which province I was stationed for many years, the bird was common, in many places extremely so, and consequently I have seen numerous nests.

The breeding season commences in the last few days of March, in Burmah a little earlier, and continues through April and May into June, but the great majority of eggs are laid in April in the lower portion of the range and in May on the higher hills.

The nests themselves are, as far as I have seen, nothing more than a rough and often scanty mass of grasses, dead leaves and other fallen rubbish collected together in some hollow, generally a natural one in the foot of a clump of bamboos, or in scrub jungle amongst thick bushes. Sometimes even I have seen the eggs merely deposited on the ground upon the dead vegetation which lay as it had dropped, no attempt having been made by the birds to scrape the leaves, etc., together as a bed for them to lie on.

At the same time Clarke describes a nest of this pheasant as being "made of twigs and leaves roughly put together, with an apology of a lining of this bird's own feathers, and possessed sufficient cohesion to permit of its removal, eggs and all, to my bungalow."

The site selected is always one in very dense jungle, and even when it is placed at the foot of a bamboo clump, this is always growing in mixed scrub and bamboo, never in the open bamboo forest which covers so much of the country this pheasant haunts. A very favourite breeding place is in the tangled secondary growth which grows up in cultivation clearings after they have been deserted for a year or two. This growth is always very matted and impenetrable close to the ground, and it is therefore almost impossible for any enemy, human or beast, to approach near enough to catch the bird whilst actually on its nest.

They breed well into the Plains at the foot of the hills, but undoubtedly the great majority nest in the low foot hills, between the level of the Plains and about one thousand feet, which are found all along their range of habitat. There is, however, one thing necessary in addition to dense cover and that is the proximity of water. Even when, as is sometimes the case, they are found breeding at far greater altitudes, 6,000 feet occasionally, I believe their nests will never be found more than two or three hundred yards from the nearest stream or pool.

Normally two eggs only form a full clutch, but I have several times taken three or four in a nest, once or twice, five, and also

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have in my collection a clutch of six taken by Dr. H. N. Coltart in Margherita, Assam.

Mr. C. W. Beebe and others have examined many female birds, and have assured me that in no case have they found more than two ova in the ovaries, and certainly no captive bird has ever been known to lay more than two eggs.

Some of my nests, however, have been found under circumstances which would appear to effectively disprove the suggestions that the larger clutches are the productions of more than a single hen pheasant.

One such instance I can well recall. I was at the time camping on the Diyung River in N. Cachar, and my camp, a cluster of rough grass huts, was placed in the middle of a number of "jhums" (rice-clearings) on the hill side, divided from one another by narrow, strips of dwarf bamboo and bush jungle. The "jhums" extended practically without interruption for nearly three quarters of a mile along the river bank whilst they also ran up the sides of the hills for a distance of a quarter to half a mile from the river. At one place, however, the ground had proved too broken to allow of easy cultivation, so that after it had been partially cleared it had been again abandoned, there, for about a hundred yards either way, had grown up a wild tangle of raspberry canes, shrubs, and high grass, interspersed with clumps of bamboos, a few young saplings, and one or two big trees which had escaped being cut by the cultivators.

I had been busy fishing in the stream below this patch, and was just about to return to my camp when I heard the hoarse chuckle of a Peacock-Pheasant in the bushes close above me. It was too late then to search for the eggs, if any, but very early the next morning with the assistance of two or three Nagas, I commenced hunting all through in the hopes of finding the nest, and in about half an hour, one of the Nagas announced the find. The nest lay in a bed of weeds and nettles and contained five eggs; the vegetation around was untrodden by the birds but a well-worn tunnel through the weeds showed how they approached and left the nest. A few nooses were set by the Naga inside the tunnel, and within half an hour the female was caught after which a beat through the bushes put up the cock bird which was shot. With the exception of a couple of Bustard Quail, this patch of cover held no other game bird, and from its isolated position it would appear most unlikely that two other hens should have discovered this nest and ventured across the open cultivation to lay in it.

The only nest recorded by Hume and Marshall is that described by Mr. Clarke who says of the eggs: "one egg hatched, the others went bad"; so in this case also there were more than two.

The eggs of the Grey Peacock-Pheasant are just like small eggs of the domestic fowl. In colour they are usually a rather rich

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café-au-lait or cream, but range from a pale cream to an almost chocolate buff. Almost invariably they are covered with specks, small blotches and stipplings of white, in some cases of a somewhat chalky appearance, but often looking merely as if the colouring pigment on the shell was wanting.

In shape they are remarkably constant, being broad ovals with the smaller end obtuse and not greatly differing from the larger. The shell is stouter and stronger in comparison than that of a Jungle-Fowl or Kalij Pheasant, the texture is close and very hard and often has a distinct gloss.

The average size of eighty eggs is 1·80″ × 1·40″ (45·7 × 35·5 mm.). In length they vary between 1·73″ and 1·9″ (43·9 and 48·2 mm.) and in breadth between 1·30″ and 1·48″ (33 and 37·6 mm.).

Many years ago the manner in which the hen pheasant screened her chicks under her tail was recorded and Hume also refers to this curious habit. He says:

> "A Bantam hen was employed as a foster mother and the "chicks *would*, follow close behind her, never coming in front to "take food, so that, in scratching the ground, she frequently struck "them with her feet. The reason for the young keeping in her "rear was not understood until, on a subsequent occasion, two "chicks were reared by a hen *P. tibetanum*, when it was observed "that they always kept in the same manner close behind the "mother, who held her tail widely spread, thus completely "covering them; and there they continually remained out of sight, "only running forward when called by the hen to pick up some "food she had found, and then immediately retreating to their "shelter."

I was once fortunate enough to observe this same behaviour in a wild bird. I was riding along a narrow, twisting forest path, the ground covered with moss and so soft and wet that my pony's feet fell almost noiseless with each step. As I turned one corner I noticed a Peacock-Pheasant scurrying along in front of me, and pressing forward on my pony I forced her to half fly, half scuttle into the bushes, and as she did so noticed two tiny chicks appeared from under her tail and dived after her.

The cock bird is not, I think, polygamous. As a rule each pair of pheasants seems to have a well defined area, within which no other birds are allowed to enter during the breeding season, and although once the young have left their parents they are never found in flocks, they seem to remain in pairs all the year round; at all events, if a bird of one sex is shot or trapped, a second of the opposite sex is almost always sure to be found close by.

Habits.—On the whole, the Grey Peacock-Pheasant is a bird neither of the higher hills nor of the Plains. It is true that it wanders up

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at least as high as 6,000 feet in the Darjiling Terai and possibly in the Kachin Hills and again on the other hand may sometimes be found in dense scrub jungle in the Plains at some distance from the mountain ranges. To make sure of finding it, however, one must work the lower hills below an elevation of some 2,000 feet, where it will be found more especially haunting the ravines, valleys and low hills where the mountains and plains meet.

It does not mind much what kind of jungle it has to reside in as long as there is ample undergrowth and, as I have already mentioned, easy access to water. I have found it in the finest of evergreen forest, in bamboo jungle, in scrub and grass, in abandoned cultivation, in the bush jungle growing on and in the edges of streams and sometimes even amongst the tea bushes in tea gardens.

It is generally considered to be a rare bird over most of the area in which it occurs, but this is because it is such an inveterate skulker that it is never seen unless one is content to spend much time and trouble in searching for it, and even then it is necessary to know its manners and customs before success can be hoped for.

Once however one knows the character of this pheasant, its haunts and its voice, it is not really a hard bird to locate. The cock crows, morning and evening, especially during the breeding season, when it may be heard for hours on end. When thus employed it mounts on an ant-hill, a stump, or even on the larger bough of some big tree a few feet from the ground and thence calls every minute or so with a loud chuckling, laughing note, sometimes accompanied by a flapping of the wings, the soft "frip-frip" of which is audible when one is a few feet away. There is never, of course, the noisy flapping indulged in by the Jungle-fowl or some of the other pheasants, for the plumage of the *Polyplectron* is so soft and lax that all feather movement of this bird is very noiseless, reminding one very much of the flight of owls and night-jars.

The females do not crow, as far as I know, but they keep up a conversational chuckle as they hunt about for food and I have often had the good fortune as I lay nearly buried in fallen leaves and dead grass, to have them come within a few feet of me.

Both male and female when thus employed keep up a continous murmur of sound "croo-croo-chuckle-chuckle-croo-croo", every now and then rising to a rather harsh rendering of the same syllables and then again sinking to a whispering chuckle, inaudible a dozen yards away. To watch them with success one must be absolutely motionless, the slightest movement and they are off, running at a great pace into safe hiding, otherwise they do not appear very keen sighted and I have sometimes remained undiscovered for ten minutes or a quarter of an hour, although well within view.

Their actions are much like those of barndoor fowls, but are slow, methodical and very secretive. Thus they do not hurl leaves,

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earth and other scraps in every direction as they scratch for food, but turn these same over with a very quiet and restrained movement and again, though they move with great speed they do not, unless frightened, progress in little rushes and they chase insects hither and thither. In moving, heads and tails are both normally held low and they quietly slink in and out amongst the lowest obstructions rather than hop over them.

It is doubtless this last trait which makes them such easy birds to trap. The Nagas and other hill tribes catch them by making a little brush-wood fence not more than a few inches high across strips of jungle frequented by pheasants, leaving here and there little openings in and about which they place mithna-hair nooses. The birds as they hunt for food come across this fence and, rather than go over it, will hunt along it until they come to an opening. and in this way walk into the nooses and are caught. They are also, as described by Inglis in "Game-Birds often caught by the Kukies" (and he might have added all the other hill tribes) by a noose set with a bait. Inglis describes the trap thus:—

> "The snare consists generally of a sapling, or branch of a "tree bent towards the ground; one end of a piece of string is "tied to the sapling, and on the other end is a noose; the "noose is spread round a small hole in the earth; the trap itself "is a simple contrivance of a few split pieces of bamboo; the "bait is a small red berry of which the bird is very fond; "the berry is firmly attached to the trap, and the bird, peck-"ing at the berry, releases the catch; the sapling flies up, and "the bird is noosed by the neck or feet."

In some parts of Burmah, the *Polyplectron* is so common and so easy to trap that the villagers bring them instead of village fowls to the officers who are touring their districts, selling them at a cheaper rate than they do the latter.

In Siam also this Pheasant appears to be very common. Mr. Gairdner writes in the Siam Natural History Society Journal:

> "The Grey Peacock-Pheasant (*Polyplectron thibetanum*) "was exceptionally common, and the call when heard from a "great height above the valley resembles that of a hoarse goat. "Near at hand it is 'qua-qua-qua' repeated with lessening "intervals until the bird apparently becomes apoplectic, and "can only screach. I have been told by trustworthy men that "the Peacock-Pheasant is the 'kaw-kaw' bird, and that on a "sudden clap of thunder a captive bird was actually seen "uttering the sound. On the crash caused by falling trees or "on a clap of thunder, this 'kaw-kaw' is instantly heard, to-"gether with the barking of any langurs within hearing, and "I have only heard this 'kaw-kaw' in jungle inhabited by the "Peacock-Pheasant."

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Mr. Pocock, in the Avicultural Magazine, has given us a most graphic account of the display of the Peacock-Pheasant which agrees well with what I have seen shown by wild birds.

On one occasion when I was lying on the ground by a tiny forest stream which rippled and fell in pigmy cascades over boulders and mossy banks, a pair of Peacock-Pheasants wandered out of the dense undergrowth into a tiny open space just in front of where I was lying. For a few minutes they scratched about for insects and then without a moment's warning the cock-bird began to display to the hen. At first he confined his attentions to running round her with tail partially extended and slightly raised and both wings drooping and spread. In a minute or two, however, he ceased to run round, and sank slowly to the ground until his breast rested on it. His tail and wings were then raised until the three were fully spread in the manner of a fan, the tips of the inner secondaries of the wings almost meeting above and in front of the tail, whilst the shoulders were brought down to the ground. The head was then withdrawn momentarily into the soft mass of feathers, but immediately protruded again on the hen moving.

At first the latter, the hen, took little if any notice of the cock bird's prancings and posturings, but after a minute or two, she became decidedly interested, and actually began herself to display in response, though her display was not as full as that of the cock, this however may have been because he did not give her time to complete it.

This display of the hen's is especially interesting and it probably accounts for the unusually small amount of difference in the plumage of the two sexes.

As Pocock has so pithily expressed it:

> "Birds do not display because they are decorated, but are "decorated because they display."

Decorative effects in birds, whether consisting of brilliancy in colour or excessive growth in any portion of the plumage, such as the possession of crests, lengthened plumes in tails, wings, etc., are the result of superabundant energy.

This extreme vitality not being necessary to the continuation of life in its normal condition is therefore expended in the creation of abnormal features which depend in the main on local muscular activities.

Nor must we forget that quiescent muscular display may be as energetic as movement, for great tension may require as much muscular and nerve effort as great vibration. Thus we have in some birds a display of expanded plumage, as in the *Polyplectron*, whilst in others, our English Warblers for instance, energy is usually shown by intense rapidity of wing motion.

In those species of birds in which the female is the dominant

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partner, *i.e.*, possesses the greater vital energy, such as the Hemapodes, Painted Snipes, etc., the signs of such superiority will be found in this sex, as in the males of other birds, either in more brilliant colouration or extravagance in some portion of the plumage, generally, if not invariably, connected with a corresponding display.

As vitality is at its highest during the breeding season so it follows that the signs or results of this vitality often come into existence on the approach of this period and again disappear at the end of it, though in many birds they have in the course of ages become permanent or partially so.

To return, however, to the object of the present article. A sight of the display of the Peacock-Pheasant is one not likely to be often viewed in a state of nature for I know of no game bird which is a more determined hider or which is harder to force out of thick jungle. A dog, of course, if a persistent worker, will eventually put it up ; and when the pheasant can no longer escape by running, it will in such cases take refuge in the bough of a tree when it will often allow of an approach for an easy shot.

But for its beauty and for the fact that it is fairly good eating, it would not be worth shooting, for its flight is comparatively slow and feeble and its soft lax plumage offers no resistance to shot.

The flesh is rather hard and dry, but white and of quite good flavour.

Polyplectrons are omnivorous feeders but on the whole more vegetarian than insectivorous. They devour grain of all kinds, including hill rice ; fruit, especially the different *fici*, jhamans or wild plums and the Ber fruit, and, above all, the seed of the bamboo. When stretches of bamboos are in seed and the latter begins to fall they become the resort of all kinds of game birds, and food is for the time being so plentiful that the birds become extraordinarily fat and heavy. I have also watched these pheasants greedily feeding on white ants and have taken the remains of snails, centipedes, and worms from their stomachs, and have also known them to feed on the young shoots of mustard and other green crops.

POLYPLECTRON MALACCENSIS.

The Malay Peacock-Pheasant.

Phasianus malaccensis.—Scop., Del. Flor. et Faun. Insubr., pt. II., p. 93 (1786).

Polyplectron chinquis.—Temm., Pig. et Gall., II., p. 363 (1813); III., p. 675 (1815) (part).

Diplectron bicalcaratum.—Vieill., Gal. des Ois., II., p. 17 (1825) (part).

Polyplectron bicalcaratum.—Gray, List of B., pt. III., Gall., p. 22 (1844); Blyth, Cat. Mus. As. Soc., p. 242 (1849); Gould, B. of

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Asia, VII., pl. 51 (1870); Elliot, Mon. Phas., I., pl. 7 (1872); Hume, Str. F., VI., p. 481 (1874); Hume and Dav., *ibid.*, VI., p. 434 (1878); Hume and Marsh., Game B., Ind., p. 114 (1878); Hume, Str. F., VIII., p. 68 (1879); Ogilvie-Grant, Cat. B. Brit. M., XXII., p. 357 (1893); *id.*, Game B. II., p. 65 (1897).

Polyplectron malaccensis.—Robinson, Cat. B. Malay Pen., p. 1 (1910).

Polyplectron hardwickii.—J. E. Gray, Ill., Ind. Zool., II., pl. 37 (1830-32).

Polyplectron lineatum.—J. E. Gray, Ill., Ind. Zool., I., pl. 38 (1830-2).

Polyplectrum bicalcaratum.—Blanf., F. B. I. Birds, IV., p. 74 (1893); Oates, Game B., I., p. 234 (1898); H. R. Baker, Jour. B. N. H. S., XVII., p. 764; Sharpe, Hand-L., I., p. 39 (1899).

Polyplectrum bicalcaratus.—Gyldenstolpe, Sued. Ex. Siam, p. 66 (1913).

Vernacular Names.—Gou-ga-san (*Siamese*).

Description—Adult Male.—Head and nape above mottled buff and dark brown with a well-developed crest of metallic green feathers, not hair-like as in *bicalcaratum;* neck and extreme upper back narrowly barred buffish white and dark brown; remainder of upper parts rich rufous-buff, dotted everywhere with black and the feathers of the mantle and most of the wing coverts with ocelli at their tips. These ocelli are blue-green without the varying reflections shown in that of *bicalcaratum*, and have only an indication of a buff ring surrounding the black one. The ocelli on the tail are similar to those of the Grey Peacock-Pheasant but run into one another instead of being separated by a well-defined dividing shaft line; many of the shorter tail feathers also have an ocellus only on the outer web. On some of the longer rectrices the colouring on the part succeeding the ocelli near the tip is richer than that preceding it.

Below, the plumage is like that of *bicalcaratum*, but browner and more uniform except on the lower neck and upper breast which is often boldly mottled; chin and throat dull buff; under tail coverts more boldly barred with black and buff than in *bicalcaratum* and with black blotches near the tip.

Measurements.—Wing 7·5″ (180·3 mm.) to 8·4″ (213·3 mm.); tail 10″ (254 mm.) to 13″ (330 mm.).

Colours of soft parts.—Iris white; legs and feet dull greenish black to black; bill, dark horn brown, culmen blackish and tip black; orbital skin dull red.

Adult Female.—Above, from forehead to neck dull brown, the centres paler, and with no crest; upper plumage as in the male but duller and less mottled, the hind neck and extreme upper back being merely finely vermiculated brown and buff. The ocelli on the back are replaced by brownish black markings and the ocelli on the tail

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are smaller and less brilliant; under tail coverts mottled brown and buff, the former in broad bars; chin and throat pale buffy brown.

Measurements.—Wing 6·8″ (164·7 mm.) to 7·5″ (180·3 mm.); tail 6″ (152·4 mm.) to 9″ (228·6 mm.).

Colours of soft parts.—Iris grey or grey brown; facial skin dull livid or fleshy red; legs and feet dull plumbeous or greenish black; bill horny brown, darker on tip and culmen.

Distribution.—Malay Peninsular and Sumatra, extending into the extreme south of Tenasserim whence I have received the skin of a female taken on its eggs. Count Gyldenstolpe records it as being common in parts of Northern Siam.

Nidification.—There appears to be absolutely nothing known about the nidification of this pheasant though a few eggs have been laid by birds in captivity. A single egg sent to me by my collectors from Tenasserim together with the female was taken on the 3rd March, and was one of a pair which were then already hard set. One was broken in transit and the other arrived safely. This agrees in every way with my eggs of the Grey Peacock-Pheasant and measures 1·8″ (47·7 mm.) by 1·45″ (36·8 mm.).

In colour it is a warm pink cafè-au-lait with innumerable freckles of white all over it.

It was said to have been laid on a nest consisting of a small pile of rubbish lying in dense undergrowth in evergreen forest.

A second egg in my collection given to me by Herr M. Kuschel and laid in captivity in Berlin measures 1·95″ × 1·66″ (49·5 × 42·1 mm.) and is, I should imagine, an abnormally large egg. It is a pale yellow cream and has none of the usual white stippling.

Habits.—In habits the Malay Peacock-Pheasant does not seem to differ from the common Indian bird. Count Gyldenstolpe records it as common in Northern Siam, especially in the evergreen forests surrounding the Mek Lem River. As usual, however, the birds were so shy and retiring that he failed to shoot a specimen, though he saw some skins of specimens which had been shot by a European.

They keep much to the lower hills and the plains at their feet, but are found up to 4,000 feet.

POLYPLECTRON GERMAINI.

Germain's Peacock-Pheasant.

Polyplectron germaini.—Elliot, Ibis, 1866, p. 56; *id*, Mon. Phas., I., pl. 8 (1872); Hume, Str. Feath., VII., p. 426 (1878); Hume and Marsh., Game B., I., p. 111 (1878); Ogilvie-Grant, Cat. B. M., XXII., p. 357 (1893); *id.* Game B., II., p. 64 (1897).

Polyplectron intermedius.—Hume, Str. Feath., I., p. 36 (1873); *id bid.*, V., p. 118 (1877).

Polyplectrum intermedium.—Oates, Game B., I., p. 234.

Vernacular Names.—Con-ga-san (*Siamese*).

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Description—Adult Male.—No crest, though the feathers of the crown are somewhat disintegrated and erectile. Upper portion of head, nape and neck, black or blackish brown, each feather with a narrow crescentic bar of dull white near the tip and another near the base, making the head appear as a whole a dull grey; round the eyes and posterior lores bare, anterior lores covered sparsely with black tipped white feathers; sides of head like the crown, but with more white, this latter increasing in extent towards the chin and throat which are white. Whole upper plumage brown, minutely speckled with pale, dull, buff, the spots forming indefinite bars near the tips of the feathers, especially on the rump and upper tail coverts. Feathers of the mantle, scapulars and inner secondaries with metallic purple-blue ocelli with three narrow rings of black, buff, and brown surrounding them. In each case the ocellus forms the tip of the feathers. Primaries, outer secondaries and the outermost greater coverts hair-brown, the primaries faintly and the other feathers profusely speckled with buff.

Rectrices like the back, each feather with a pair of ocelli like those on the mantle but much larger, and green instead of purple-blue, though those on the shorter tail feathers are somewhat more blue than the others.

Lower plumage like the upper, but with the buff markings more numerous and better defined in bars and terminal edgings.

Colours of soft parts.—" Legs black, iris brown" (Vassal). Bill appears to be a rather light horny with tip and culmen darker.

Measurements.—Wing 7·9″ (200·6 mm.) to 8·25″ (209·5 mm.); tail 9″ (228·6mm.) to 12·5″ (317·5 mm.); bill at front about ·7″ (17·7 mm.) and from gape about 1·2″ (53·5 mm.); tarsus about 2·5″ (63·4 mm.).

Adult Female. Like the male but with the pale freckling finer and less defined in bars. The ocelli are smaller and a still deeper purple in colour with more black in proportion and shaped rather as diamonds than circular. Feathers of the mantle white shafted and some of those of the lower plumage also pale shafted.

Colours of the soft parts.—As in the male.

Measurements.—Wing 7·3″ (185·4 mm.) to 7·8″ (198·1 mm.); tail about 9·5″ (241·3 mm.); bill at front about ·65″ (16·4 mm.) and from the gape about 1·1″ (27·9 mm.); tarsus 2″ (50·8 mm.).

Young Males are like the females but the ocelli on the mantle and tail feathers are intermediate between those on the female and those on the male.

Of the few specimens I have been able to examine of this species, three adult males have two spurs on either leg and one has three on one leg and two on the other. The females have no spurs and the young males have none or only one very small blunt spur on one or both tarsi.

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Distribution.—Cochin China, Annam, W. (South-East Looshai Hills?).

At present all that is known concerning this bird's occurrence within our limits is the fact that Hume obtained some tail feathers of a bird from the Looshai Hills precisely like those of *P. germaini.* It appears incredible that this bird should be found in two places so far apart as Cochin China and the Looshai Hills and separated, as we know, by intervening species, for North, South, East and West immediately round about the Looshai Hills *P. bicalcaratum* has been found, whilst further East and South between *P. bicalcaratum* and *P. germaini* we have the further interruption of *P. malaccensis.*

When stationed in N. Cachar, adjoining the Looshai Hills, I made many attempts to obtain skins of the Peacock Pheasants from the latter district, but only got a few from the North and West, which were all of the Common Grey Peacock—Pheasant. Eventually, however, although I failed to obtain any complete skins from S. E. Lushai, Mr. Charles Murray sent me a Looshai chief's head-dress in which were some tail feathers of Germain's Peacock—Pheasant or of some very closely allied form. On the strength of this I retain *germaini* on our list for the present, but I feel sure that when we do get complete skins from South and East Looshai, they will prove to be merely the somewhat buff coloured form of *bicalcaratum* found in the adjacent Chin Hills.

Germain's Peacock-Pheasant is a comparatively common bird in captivity but there is practically nothing on record about it in its wild state.

It is a shy, skulking bird frequenting thick cover and like others of the genus, difficult to sight without a quick dog to force it to rise.

Nidification.—Its breeding habits are as yet unknown but will assuredly be found similar to those of the Grey Peacock-Pheasant. Eggs laid by captive birds are indistinguishable from those of that bird though they may average a trifle smaller.

(*To be continued.*)

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SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY.

No. XII.

A.—On the Squirrels obtained by Messrs. Shortridge and Macmillan on the Chindwin River, Upper Burma.

(*With a coloured plate and map.*)

By Oldfield Thomas and R. C. Wroughton.

(*Published by permission of the Trustees of the British Museum*).

The collection of Squirrels obtained on the Chindwin by the Society's collectors for the Mammal Survey, G. C. Shortridge and the late Capt. S. A. Macmillan, forms the most wonderful series that has ever come to the National Museum from any one district. It was known already from certain of the striking forms described by Thomas that the squirrels of this region would particularly repay investigation, and special efforts were therefore made by the collectors to form really complete series from as many stations as possible.

Thanks to favourable conditions and the ready help afforded them by officials of all classes, Messrs. Shortridge and Macmillan's expedition was most successful and especially so in regard to squirrels, of which just on 400 specimens were obtained, illustrating thoroughly the squirrel life of both sides of the river from Yin in 22° 50′ N. Latitude up to Hkamti 26° 5′, near the source of the river, a distance of about 250 miles.

Knowing the problems involved, Mr. Shortridge was able to make the series thoroughly illustrative of the subject, so that we have never had to leave a question unsettled for want of material, at least so far as the Chindwin valley is concerned. The relation of this river to the Irrawaddy to the East, and to Manipur on the West, must, of course, await similar collections from those localities.

One flaw only exists in the series, and for this the collectors are not responsible. Namely that it is all made at one season of the year, and therefore that matters arising from seasonal change cannot now be dealt with.

For this reason especially we wish to urge local residents or visitors not to think that the subject is exhausted, as specimens killed at different dates are still wanted from all localities.

So far as we have been able to make out, the collection, which belongs to the genera *Ratufa*, **Callosciurus*, **Tomeutes*, *Tamiops* and *Dremomys* and is exclusive of Flying Squirrels, includes

* For the substitution of these two Generic names for the old name *Sciurus* see Thomas' paper Ann. Mag. N. H. (8) xv. p. 383, 1915.

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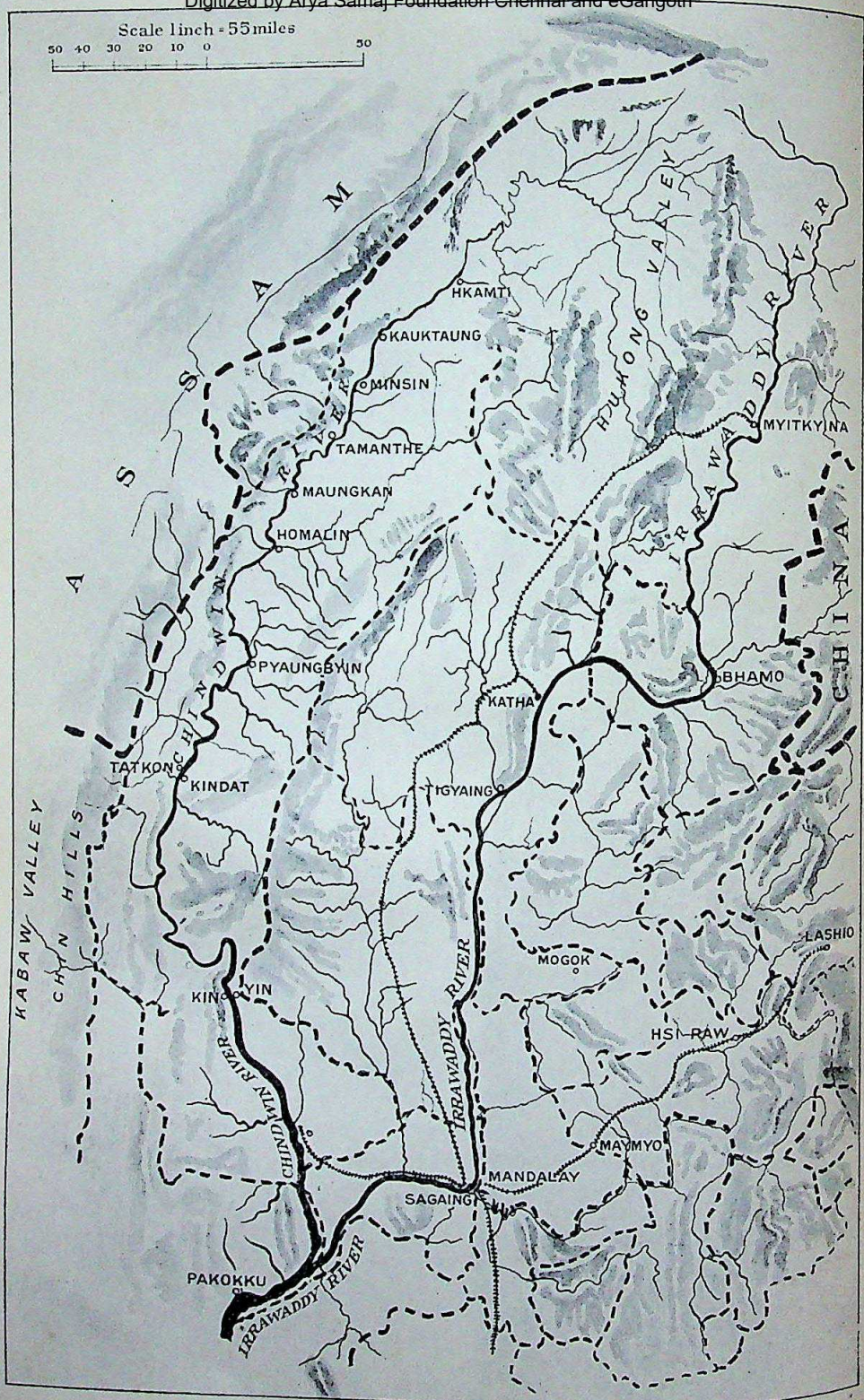

KEY MAP TO DISTRIBUTION OF THE DORSAL STRIPED SQUIRREL IN THE RIVER BASINS OF THE CHINDWIN AND IRRAWADDY, UPPER BURMA.

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21 species and subspecies, of which we have had occasion to describe no less than 11 as new, besides two from other sources. For this really splendid result Science has to thank the efforts of the Bombay Natural History Society, to whom also the National Collection is indebted for the donation of so complete a series of the specimens as fully to illustrate the conclusions we have come to. And in this invaluable donation there are included all the types of the new forms described.

Taking the collection of squirrels as a whole, one of its most striking features is its indication of the sharp line of demarcation which the River Chindwin forms to the eastward or westward extension of the different species. With the exception of *Ratufa gigantea*, occurring near the source, where it may have spread round, and a small and perhaps native—caused irruption of *Tomeutes lokroides* across the river at Homalin, no species or subspecies occurs on both banks of the river. Indeed the species on the two sides are generally referable to different groups, thus indicating that the separation has been of long standing, long enough for the groups on each bank to have respectively evolved within themselves the rich series of subspecies found in succession from North to South.

The following table indicates the different species and subspecies as they occur down the two sides of the river:—

	West Bank.	East Bank.
Hkamti .. N. Lat. 26° 5′.	*Ratufa gigantea* ..	*Ratufa gigantea.*
	Callosciurus erythræus crotalius.	*Callosciurus sladeni shortridgei.*
	Tomeutes lokroides ..	*Tomeutes similis owensi.*
		Dremomys rufigenis opimus.
		Tamiops macclellandii.
Kauktaung ..	.....	*C. sladeni shortridgei-fryanus.*
		T. similis owensi.
Minsin ..	.....	*C. sladeni fryanus.*
		T. similis owensi.
Tamanthe ..	*C. erythræus nagarum* ..	*C. sladeni careyi.*
	T. lokroides ..	*T. macclellandii.*
Maungkan ..	.....	*R. gigantea.*
		C. sladeni haringtoni.
		T. macclellandii.
Homalin ..	*C. erythræus nagarum* ..	*C. sladeni haringtoni.*
	T. lokroides ..	*T. lokroides.*
		T. macclellandii.
Pyaungbyin ..	.....	*C. sladeni millardi.*
Tatkon (W)— Kindat (E).	*R. gigantea lutrina* ..	*C. sladeni sladeni.*
	C. erythræus kinneari ..	*D. rufigenis adamsoni.*
	T. lokroides ..	.....
	Dremomys macmillani ..	.....
Kin (W)— Yin (E).	*T. lokroides mearsi* ..	*Ratufa fellii.*
		C. sladeni rubex.
		C. pygerythrus janetta.

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Tamiops was also obtained to the West of the river, but not at any riverside station—only farther back among the hills.

Ratufa gigantea, McCl.

Seven from Hkamti, both East and West banks, and one from Maungkan, East bank.

Just at Hkamti, comparatively near the source, the same form is found on both banks of the Chindwin, but lower down, as with other squirrels, the river makes a sharp dividing line between different species and subspecies. On the East bank *R. gigantea* does not range below Maungkan, but on the West at Tatkon opposite Kindat, it is represented by a special subspecies.

Ratufa gigantea lutrina, subsp. n.

Essentially like true *gigantea*, but paler in both phases of the pelage. Unworn fresh fur chocolate-brown, or otter-colour, instead of black. Worn pelage bleaching to pale brown, or whitey-brown, commonly near "tawny-olive," much paler than the corresponding pelage of true *gigantea*. Tail with the hairs of its tip much lighter than the rest, often nearly white; the tail-end of *gigantea* is quite concolorous with the rest.

Dimensions of the type:—Head and body, 397 mm.; tail, 520; hindfoot, 84; ear, 32.

Skull:—Length, 77.

Habitat.—Lower parts of Upper Chindwin, on West bank. Type from Tatkon, opposite Kindat. Alt. 250′.

Type.—Adult female. B. M. No. 15. 5. 5. 52. Original number 5622. Collected 5th July 1914. Five specimens from Tatkon, one from Sadwin, and three native skins from the Kabaw Valley, 300′.

We have as yet no knowledge of what *Ratufa* occurs in Manipur, but it will very probably be this subspecies, which is characterized by its paler colour and light tail-tip. Nor is any member of the genus found on the West bank lower down the Chindwin than this.

Ratufa fellii, sp. n.

Similar to *R. phœopepla* in general characters, that is to say in the arrangement and distribution of the dark upper and buffy lower colour, including the wash of buffy half across the forearms, but while the head and limbs are black above as in that species, the middle of the body, from the withers to the rump, is greyish brown (between natal-brown and buffy-brown) in fresh pelage. The old pelage, which is present on the posterior back of every adult specimen, is dirty-whitish or straw colour, contrasting strikingly with the dark-brown or black of the foreback, and quite different from the

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dull brown of the old bleached fur of *R. phœopepla*. Tail-hairs mixed brown and black, except in the young specimens, in which they are black tipped with rufous.

Dimensions of the type:—Head and body, 365 mm.; tail, 435; hindfoot, 77; ear, 28. Skull:—Greatest length, 72; condylo-incisive length, 64; upper tooth series, 13·7.

Habitat.—Yin, East bank of Lower Chindwin. Alt. 250′.

Type.—Adult male. B. M. No. 15. 5. 5·55. Original number 5379. Collected 13th June 1914. Twenty-one specimens.

This *Ratufa* is readily distinguishable from *R. phœopepla* and *melanopepla*, with which alone it needs comparison, by the much lighter colour of the trunk, and by the bleaching nearly to white of the old fur before replacement. Owing to the accident that all the adult specimens obtained during the Survey expedition were taken when half or more of the back was in this bleached condition, the difference is made to appear rather more striking to the eye than would be the case if two round-the-year series were compared with each other. But there is no doubt that the animal should be distinguished specifically, all the more that Mr. Shortridge tells us that no *Ratufas* occur between this and Mt. Popa, the nearest locality of *R. phœopepla*. Moreover the skull agrees in size with that of true *melanopepla* of the Malay Peninsula, and not with that of the large Burmese *R. p. marana*.

We have named this fine animal in honour of Mr. G. B. H. Fell, C.I.E., I.C.S., to whom Mr. Shortridge has been immensely indebted for help of all kinds throughout his stay in Burma.

R. fellii would seem to have a very restricted range, as it was only obtained at the one locality Yin.

While working out the Chindwin *Ratufas* we have again examined those from Mt. Popa in the light of Mr. Miller's paper on the *melanopepla* group, and find that they are most nearly allied to his *R. phœopepla* of S. Tenasserim, but may be subspecifically distinguished as follows.

Ratufa phœopepla marana, subsp. n.

Size as in *R. phœopepla*, the skull markedly larger than in true *melanopepla* and other forms from the regions South of Tenasserim. Colour of body when in fresh pelage black, not brown as in *phœopepla*.

Dimensions in flesh of the type:—Head and body, 390 mm.; tail, 470; hindfoot, 86; ear, 30. Skull:—Greatest length, 74·3; condylo-incisive length, 67·5; upper toothrow, 14·4.

Habitat.—Dry zone of Burma. Type from Mt. Popa.

Type.—Adult female. B. M. No. 14. 7. 19. 107. Original number 3,892. Collected 26th September 1913 by G. C. Shortridge. Presented by the Bombay Natural History Society.

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Mr. Miller has shown that some members of this group are truly black, while others are only a deep chestnut brown. The form inhabiting Tenasserim as far north as Moulmein is of the latter colour, the British Museum possessing examples of it from Mergui, and Thoungyah, near Kaukaryit. On the other hand the Popa specimens are quite black, when in unbleached pelage, and in this respect resemble *celænopepla* from Domel Island, Southern Mergui Archipelago, but the occurrence of the brown *phæopepla* on the mainland far north of Mergui indicates that the Popa form cannot be the same as that of Domel.

Callosciurus erythraeus, Pall.

Of the *erythraeus* group the Chindwin collection contains 63 specimens, all obtained on the West bank, the species apparently not occuring on the East bank of the river. There seem to be three subspecies represented among them, of which two are new, and the third is the same as an Assamese form which has been long known, but has not hitherto had a special name. We commence by describing the latter.

Callosciurus erythraeus nagarum, subsp. n.

Whole upper surface grizzled grey, the dorsal area more suffused with buffy. Undersurface rich maroon red. Hands and feet like back, darkening terminally to black. Tail grizzled like body for its basal three-fourths, the hairs ringed white and pale buffy, the terminal fourth gradually passing into deep black.

Dimensions of the type, measured on the skin :—Head and body (*c*) 230; tail, 235; hindfoot, 51. Skull :—54·5.

Habitat.—N. E. Assam, Manipur, and neighbouring parts of Upper Burma. Type from Sadiya, Assam.

Type.—Adult male. B. M. No. 85. 8. 1. 170. Collected April 1877. Presented by Allan O. Hume, C. B.

Distinguished by the simplicity of its coloration, without any of the special markings that are found in other forms of this variable group.

This subspecies is in part the "*Sciurus rufiventer*, Geoff. (?)" of Blyth's 1847 paper on Squirrels,* and the "summer pelage" of *Sciurus erythraeus erythrogaster* of Bonhote.† It is, however, certainly not the true *rufiventer*, which is American; and with regard to *erythrogaster* we are convinced that, as Thomas stated in 1886‡ the two pelages described by Bonhote as those of summer and winter are really indicative of racial and not of seasonal difference. Bonhote's "winter pelage" is the true *erythrogaster* of Blyth.

Of this squirrel the Museum contains, besides the type and

* J. A. S. B. XVI, p. 871.

† Ann. Mag. N. H. (7) vii, p. 162, 1901.

‡ P. Z. S. 1886, p. 61.

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another from Assam, examples from Aimole and Machi, Manipur, also presented by Mr. Hume, and now the Shortridge-Macmillan collection includes six specimens from Tamanthe, one from Homalin, one from Nankakauk, Kabaw Valley, and two from Haingyan, Chin Hills. One of these last-named has a grey grizzled line down the centre of the belly, the other not.

Callosciurus erythræus crotalius, subsp. n.

Like *C. e. nagarum* but the tip of the tail with an admixture of white or yellowish hairs.

General colour above grizzled grey, more or less suffused with buffy ("dresden-brown" of Ridgeway). Shoulders, sides and hips clearer grey without the buffy suffusion. Hands and feet grizzled grey darkening terminally to black; the metapodials often with a slight extension of rufous trespassing over them from below. Whole of undersurface and inner side of limbs deep rich rufous. Tail for its basal three-fifths grizzled or indistinctly annulated with black and pale buffy, the subterminal fifth black, the tip with a variable number of white and pale yellowish hairs which may amount to enough to make a definite terminal light tassel, or may in a few cases be altogether absent, the tail end being then black; in the majority of specimens an intermediate condition occurs.

Dimensions of the type, measured in the flesh:—Head and body 245 mm.; tail, 228; hindfoot, 52; ear, 21. Skull:—Greatest length, 55.

Habitat.—Extreme Upper Chindwin. Type series from Hkamti.* Alt. 500'. One specimen also from Hukong Valley, 20 miles North of Hkamti.

Type.—Adult male B. M. No. 15.5.5.69. Original number 5,969. Collected 7th August 1914 by G. C. Shortridge and S. A. Macmillan. Presented by the Bombay Natural History Society. Thirty-nine specimens.

Callosciurus erythræus kinneari, subsp. n.

Tail white with a black tip.

Colour of body and limbs as in the previous race, though on the average the back is rather less suffused with buffy, so that the general tone is near "light greyish olive" of Ridgeway. Tail for its basal inch or two grizzled grey like the body, then for five or six inches its hairs are creamy white, their extreme tips only black; finally the terminal tuft is deep black.

Dimensions of the type, measured in the flesh:—Head and body, 230 mm.; tail, 233; hindfoot, 57; ear, 22; weight, 11¾ oz. Skull:—Greatest length, 56·5.

* This is the Hkamti on the Chindwin, about 26·5 N., 95·55 E. There is another in Kachin, about 27·30 N., 27·30 E.

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Habitat.—Southern part of Upper Chindwin, on West bank. Type series from Tatkon, opposite Kindat. Alt. 250′. One specimen also from Ahlaw, Kabaw Valley. Alt. 300′.

Type.—Adult male. B. M. No. 15.5.5.79. Original number 5,492. Collected 26th June 1914. Fourteen specimens.

In two specimens out of fourteen the whitening of the middle portion of the tail is less conspicuous, the white being overlaid with grey, but even in these there is more white present than in the allied forms.

This striking squirrel, which is readily distinguishable by the unique marking of its tail, we have named in honour of Mr. Norman B. Kinnear, the Curator of the Society's Museum in Bombay, to whose hearty co-operation much of the success of the Survey is due.

Callosciurus sladeni, Anderson.

It is among the members of the *C. sladeni* group that the most wonderful results have been attained by Messrs. Shortridge and Macmillan as they collected no less than 180 specimens belonging to seven distinguishable subspecies, all the way down from Hkamti in the North of Upper Chindwin to Yin in Lower Chindwin, these subspecies occurring in succession down the East bank of the river, to which this group is confined.

From what we already know, this *C. sladeni* group would appear to be spread all over the area between the Upper Irrawaddy and the Chindwin, but whether it extends to the East of the former partly remains to be seen, and partly depends on the value we assign to the characters distinguishing it from species beyond this area. For it is extraordinarily difficult to decide which forms should be reckoned as "species" and which as "subspecies," deeper and more essential characters being almost non-existent, while the colour-characters—locally constant and therefore demanding some form of technical name—show an almost unlimited degree of intergradation.

Already from the present series it is evident that the whitish forms referred to *C. haringtoni* intergrade with the greyish ones representing *C. sladeni*, so that we have no alternative but to consider the whole lot as one species with a considerable number of local subspecies. Thomas had already spoken of the essential relationship of the two forms to one another, and we are not now surprised to find that they intergrade.

It is curious to note that while there is a considerable local constancy in general colour, certain characters which have been used to distinguish subspecies prove to be entirely inconstant. This is notably the case with the black line which in many specimens runs along the side of the body and along the forearms,

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forming a very conspicuous mark, while in other specimens from the same localities this line is reduced, broken or altogether absent. On this account Thomas's *C. haringtoni solutus* must be considered a synonym of true *haringtoni*.

On the other hand the characters that are of use are the general colour of the upper surface, the extent of the facial light mask, whose actual colour is of less constancy, and the general coloration of the tail. Even these are, of course, variable to a certain extent, but the series we have been privileged to examine shows a sufficient average constancy in them to justify our using them for subspecific distinction.

The following are the collecting stations at which these squirrels were obtained, with their approximate distance from Hkamti southwards in miles, following roughly the course of the river, but not its smaller windings :—

Hkamti	26°-5′ N.	95°-55′ E.	
Kauktaung...	25 miles	S. of Hkamti.	
Minsin	50	,,	,,
Tamanthe	65	,,	,,
Maungkan	85	,,	,,
Homalin	105	,,	,,
Pyaungbyin	140	,,	,,
Kindat	180	,,	,,
Yin	250	,,	,,

The range in altitude is not great, only some 300 feet in all.

Of these nine stations only two do not have a peculiar form of *C. sladeni*, Kauktaung having one practically the same as that of Minsin, while those of Maungkan and Homalin are also quite the same. We therefore get from Hkamti to Kindat a definably different form on the average every thirty miles, a longer distance (70 miles) separating the seventh subspecies at Yin from that of Kindat.

How far this remarkable plasticity compares with that of other mammals elsewhere we have no material to judge, but a reference may be made to the *Tragulí* of the Rhio Linga Archipelago worked out by Mr. G. S. Miller.* There, while the great areas of Sumatra and the Malay Peninsula only have one form of a certain type, the little Archipelago, about a hundred and fiftieth of their extent, has developed seven, but the problem of their causation is affected by insularity, while the squirrels of the Chindwin have evolutionized in a continuous land area.

To what distance eastwards from the river the different subspecies range remains to be proved. Some at least extend to the Irrawaddy, but whether down the west side of that river the whole seven will again be found we can at present express no opinion.

* Proc. U. S. National Mus. 37, p. 1. pts. 1-3, 1909.

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The following are brief descriptions of the seven Chindwin subspecies we recognise, passing from north to south :—

1. *Callosciurus sladeni shortridgei*, subsp. n.

(See plate fig. 1.)

General colour above grizzled "cinnamon-brown" or "Dresden brown." Light facial mask small, rarely extending beyond eyes and sometimes almost absent. Feet and under surface buffy or ochraceous. Tail like the body, but more coarsely grizzled for four-fifths its length, the end ferruginous, commonly bleached to yellowish at the extreme tip. A faint demarcational line rarely present. No light hip patch.

Dimensions of the type, measured in the flesh :—Head and body, 235 ; tail, 262 ; hindfoot, 54 ; ear, 23. Greatest length of skull :—56·4.

Habitat.—Hkamti, Upper Chindwin. Alt. 500′.

Type.—Adult female. B. M. No. 15.5.5.104. Original number 5,863. Collected 28th July 1914. 43 specimens examined. One only coloured like the next subspecies.

We have named this fine squirrel, the terminal discovery of his expedition up to the Chindwin, in honour of Mr. Shortridge himself, in token of his enthusiastic interest in the subject, which has resulted in the collection of the magnificent series before us.

2. *Callosciurus sladeni fryanus*, subsp. n.

(See plate fig. 2.)

General colour above more buffy than the last, approaching "tawny-olive," grizzle with black. Under surface varying from buffy to ochraceous. Feet and mask very light, pale buffy or whitish, the mask extending on to the forehead. Proximal three-fourths of the tail like body, the end ochraceous or buffy—less rufous than in *shortridgei*. A whitish or pale buffy patch outside hips, as in members of the *lokroides* group.

Dimensions of type :—Head and body, 238 ; tail, 273 ; hindfoot, 56 ; ear, 22. Skull length, 56·3.

Habitat.—Minsin, Upper Chindwin. Alt. 450′.

Type.—Adult female. B. M. No. 15.5.5.117. Original number 6,055. Collected 14th August 1914. Seven specimens quite typical in colour, and an eighth more like *C. s. careyi*.

Of three specimens from Kauktaung, half-way towards Hkamti, two agree best with this form, while the third is more like *shortridgei*.

Named after Mr. T. B. Fry, to whom both Miss Ryley and we ourselves have been indebted during the last three years for an immense amount of clerical help in sorting and labelling the material obtained during the Bombay Society's Survey.

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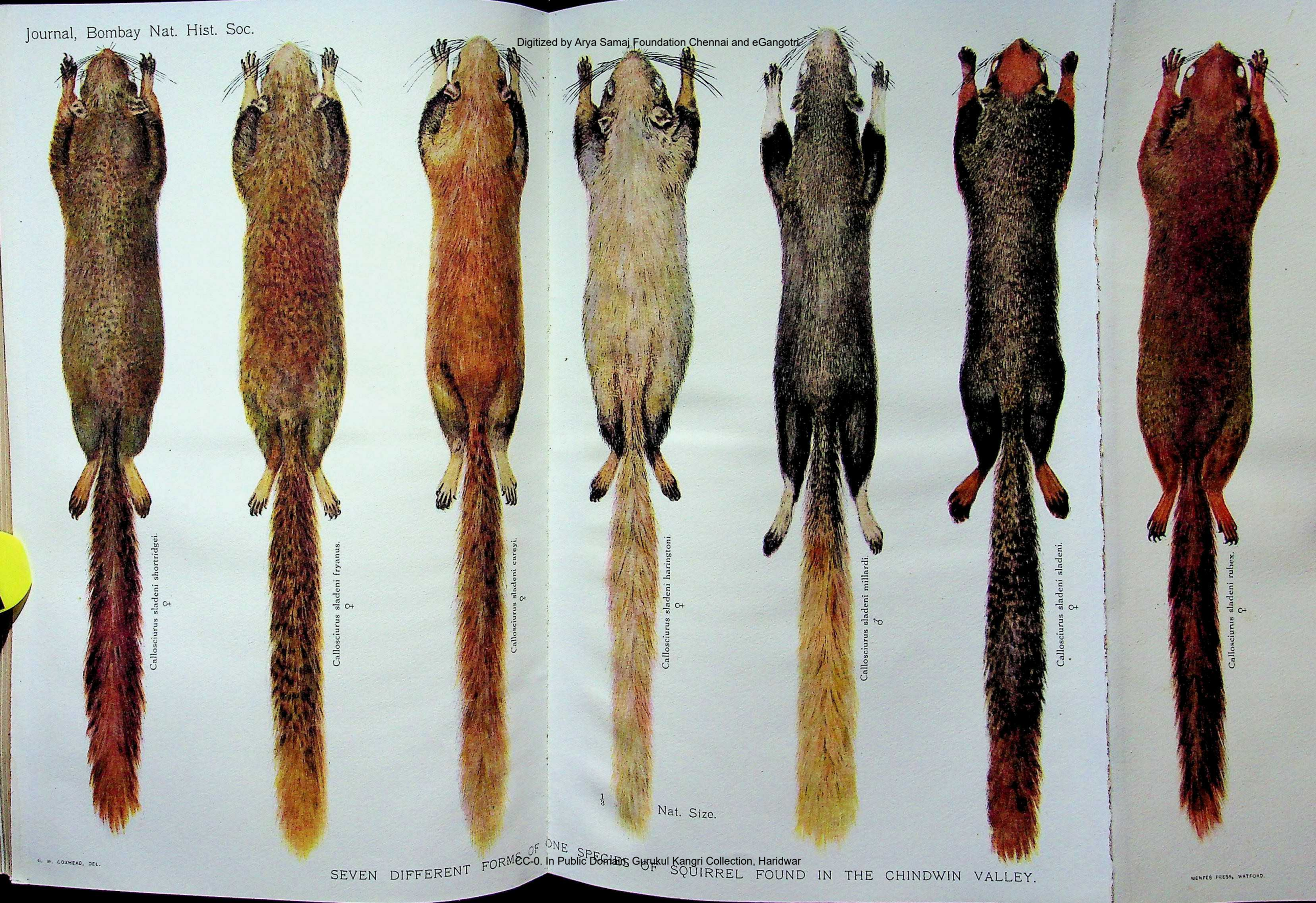

SEVEN DIFFERENT FORMS OF ONE SPECIES OF SQUIRREL FOUND IN THE CHINDWIN VALLEY.

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3. *Callosciurus sladeni careyi*, subsp. n.

(See plate fig. 3.)

General colour buffy or ochraceous, almost or quite without black grizzling. Undersurface buff. Hands, feet and mask paler buff the latter extending well up on to the crown. Tail from close to its base coloured like the back, nearly uniform ochraceous, with comparatively few and inconspicuous blackish rings on the hairs, the extreme tip paler and more buffy. An indistinct lighter hippatch present.

Dimensions of the type:—Head and body 254 mm.; tail, 284; hindfoot, 56; ear, 23. Skull:—Length, 57·7.

Habitat.—Tamanthe, Upper Chindwin. Alt. 430′.

Type.—Adult female. B. M. No. 15.5.5.121. Original number 6,065. Collected 16th August 1914.

This form is characterised by its ochraceous colour, without grizzling, the absence of grizzling and the almost wholly light tail separating it from the previous subspecies, while its stronger and more ochraceous tone distinguishes it from the nearly white *haringtoni*.

Named in honour of Mr. B. S. Carey, C.S.I., C.I.E., Commissioner of the Division, to whose assistance Mr. Shortridge has been greatly indebted during the whole of his work.

4. *Callosciurus sladeni haringtoni*, Thos.

Sciurus haringtoni, Thos.

Sciurus haringtoni solutus, Thos.

(See plate fig. 4.)

General colour varying from buffy to nearly white, without black grizzling. Undersurface buffy or ochraceous; black demarcational line present or absent. Mask buffy or whitish, extending well up on to the crown. Hands and feet buffy. Tail pale buffy or white, without annulations on the hairs. A pale hip patch visible whenever the general colour is dark enough to show it.

Dimensions of an adult female:—Head and body, 260 mm.; tail, 271; hindfoot, 56; ear, 22.

Habitat.—Moungkan 420′ and Homalin 400′, Upper Chindwin. 47 specimens in the present collection, besides the two original examples obtained by Major Harington.

Thus far, passing southwards, the body colour of these squirrels has been getting lighter and lighter, but now, with the passage of the river Uyu, the largest Eastern tributary of the Chindwin, an abrupt change takes place, the body becoming quite dark, though the mask, feet and tail remain light.

5. *Callosciurus sladeni millardi*, subsp. n.

(See plate fig. 5.)

General colour above dark grizzled grey, the light rings on the hairs buffy. Undersurface rich buffy, a black demarcational line

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present. Mask (which extends to crown), hands and feet creamy white. No light hip patch. Tail with its basal fourth like the body, the remainder uniform ochraceous or buffy, the ochraceous examples becoming paler and more buffy terminally.

Dimensions of the type :—Head and body, 247 mm.; tail, 254; hindfoot, 55; ear, 23. Skull:—Length, 58.

Habitat.—Pyaungbyin, 40 mi. N. of Kindat, Upper Chindwin.

Type.—Adult male. B. M. No. 15.5.5.136. Original number 5,484. Collected 21st June 1914. Seven specimens.

This subspecies resembles *haringtoni* in the buffy or whitish colour of its face, feet, and tail, though the last tends to be more ochraceous, but is distinguished by its dark grey instead of whitish general body colour.

With this handsome and conspicuous squirrel we have much pleasure in associating the name of our friend Mr. W. S. Millard, Honorary Secretary of the Bombay Natural History Society, to whose energy and generosity the success of the Society's Mammal Survey is mainly due.

6. *Callosciurus sladeni sladeni*, Anders.

(See plate fig. 6.)

General colour above grizzled olive grey, about as in *millardi*. Undersurface deep ochraceous or ferruginous. Feet and mask ochraceous, rarely buffy, the mask extending well up on to the crown. Demarcational line present or absent. Proximal three-fourths of tail grizzled like back, the tip ferruginous.

Habitat.—(On Chindwin) Kindat, 250′. Type of *bartoni* from the Uyu River.

The 40 Kindat specimens are very uniform in colour, mostly quite like true *sladeni*, but in one the mask is buffy, as in *C. s. bartoni*. Further material from other localities will be needed before we can express a definite opinion about the last-named form.

7. *Callosciurus sladeni rubex*, Thos.

(See plate fig. 7.)

General colour above dark grizzled olive grey, washed on the back with rich ferruginous, which very commonly extends to cover the whole dorsal surface, and in one case the sides as well, so that the whole animal is then uniformly red. Muzzle, feet, and end of tail rich ferruginous.

Habitat.—(On Chindwin.) Yin, 70 miles below Kindat. (24 specimens.)

The Yin series presents great variation in the extent of the rufous on the body, one specimen being almost without it while another is practically wholly rufous, and thus resembles the Siamese *S. cinnamomeus*. A trace of difference between the upper and lower surfaces is however always perceptible, which is not the case with *cinnamomeus*.

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Tomeutes pygerythrus janetta, Thos.

Sixteen from Yin and two from Monywa, both on the east bank of the Chindwin.

Passing now to a very different group of Squirrels, we find some interesting points in distribution, even where the species have already been described.

The present form, which was described from Mandalay, is found on the east bank of the Chindwin up to Yin, not penetrating at all to the west, nor further northwards than that place, no squirrel of this type therefore occurring till north of the Uyu at Homalin there is a slight eastern irruption of the next species, and again much further on at Kauktaung and Hkamti; where there is the form of *T. similis* described below. Southwards *T. p. janetta* ranges to Mt. Popa and Pyawbwe, and a certain distance up the Irrawaddy above Mandalay.

We thus find that while the north and south line of the Chindwin and Lower Irrawaddy is an absolute barrier to the extension of this Squirrel westwards, the Upper Irrawaddy, above the junction, is no such barrier, the species occurring indiscriminately on both sides.

The cause of this difference probably depends on the greater frequency or accessibility of temporary islands, joined sometimes to one side and sometimes to the other, in the Irrawaddy as compared to the Chindwin, although Mr. Shortridge states that such islands occasionally occur also in the latter river. But the very marked way in which throughout the fine series of Squirrels in the present collection the species of the East and West banks of the Chindwin are different from each other makes it difficult to believe that such island pontoons can be readily utilized for crossing the river. Mr. Shortridge himself believes that the more rapid current of the Chindwin breaks up the islands more quickly than in the Irrawaddy.

All these specimens, like the original ones, have a whitish hip-patch, while none is present in most of our skins of true *pygerythrus*, from Lower Burma. But we have come to the conclusion that this difference is wholly one of season, and that in all the present group of squirrels no thigh-patch is present during the winter months—say, from December to March—while July and August specimens always have them. This seasonal variation would explain the differences observed in several other cases, notably in the complicated problem presented by the Himalayan forms *T. lokroides* and *similis*.

Tomeutes lokroides, Hodgs.

Squirrels representing this long known Nepalese and Sikkim species occur all down the west bank of the Chindwin, from Hkamti to Kin, only just trespassing across the river in one place, at Homalin. This place we may note is in the area where no east-bank species of the group occurs, *T. similis* being some way

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to the north, and *T. pygerythrus janetta* to the south of this point. Once across therefore there would be no competition to restrain its establishing itself on the eastern bank.

As usual we find the Lower Chindwin form of *lokroides* different from the Upper, the former being *T. l. mearsi*, Bonh., with type locality Chinbyit, not very far from Kin, while the latter does not at present appear to be separable from true *T. lokroides*. But about this we shall know more when the Society's Survey collections from Sikkim arrive.

Judged by the present fine series *T. l. mearsi* is distinguishable from true *lokroides* by the more buffy suffusion of its back, and by the whitish hip-patch being bordered above by a more or less prominently ochraceous area, which may pass right across the lower back. It is true that the ochraceous coloration does not occur in the type series (4 specimens), but these were all collected in the winter, and do not show the hip-patch at all. In the specimens of true *lokroides* the general colour of the hips is dark grizzled greyish, with which the whitish hip-patch abruptly contras.

The collection in all contains 53 examples of *T. lokroides*, and 36 of *T. lokroides mearsi*.

Tomeutes similis owensi, subsp. n.

Tomeutes similis, Gray, from Nepal and Sikkim, has not usually been recognized as distinct from *T. lokroides*, its characteristic ochraceous hips having been ascribed in the usual casual way to "variation" in the latter species. But, on such material as now exists, we think that Gray was right in separating them. The hip-patch of *T. lokroides*, is white or whitish, that of *similis* ferruginous. In specimens without hip-patch (presumably killed in winter) we are not as yet able to point out any distinguishing marks.

On the East bank of the Upper Chindwin our collectors obtained six specimens agreeing with *T. similis* in having ferruginous hip-patches but differing in other characters, as follows.

General ground colour above essentially of the same dark grizzled olive grey as in true *similis*, but the whole back strongly suffused with deep rufous, becoming stronger posteriorly, the loins practically grizzled "chestnut", passing without contrast into the ferruginous of the hip-patch. Head, neck and shoulders grey. Undersurface buffy, a more or less distinct grizzled greyish line running down the centre from the throat to the belly; a small central patch in inguinal region whitish. Inner side of forearms whitish, of legs strong buffy. Hands and feet grizzled grey, with or without buffy intermixture. Tail coarsely grizzled grey with but slight buffy suffusion; the terminal hairs black.

Dimensions of the type:—Head and body, 216 mm.; tail, 202; hindfoot, 46; ear, 23. Skull:—Length, 51·5.

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Habitat.—Upper Chindwin, east bank; type from Minsin, 450'. Other specimens from Hkamti and Kauktaung. Six specimens in all.

Adult female. B. M. No. 15.5.5.189. Original number 6,060. Collected 15th August 1914.

True *T. similis* is grizzled the whole way down the back, and does not appear to have a mesial grey abdominal stripe.

This striking squirrel, the representative in Burma of the little known *T. similis* of Nepal and Sikkim, we have named after Major F. C. Owens, Deputy Commissioner of Sagaing, to whom Mr. Shortridge has been indebted for help, and who has also contributed to the Survey a number of specimens from districts which our collectors were unable to visit.

Tomeutes stevensi, Thos.

One female from South of Hukung Valley, 20 mi. N. of Hkamti, Upper Chindwin. Alt. 530'.

This specimen has a dark buffy hip-patch, while none is present in the other examples in the Museum. They are however—when dated—all winter specimens, while this one was killed in July.

Dremomys rufigenis adamsoni, Thos.

Eight from Kindat, 250'. East bank.

These specimens agree closely with the type, which was collected at Maymyo, just east of Mandalay, the Irrawaddy being here again no barrier to the distribution of the species, while the Chindwin separates *D. rufigenis* from *D. macmillani*, described below.

From the extreme Upper Chindwin however, still on the East bank, the representatives of this species form a special race, as follows:—

Dremomys rufigenis opimus, subsp. n.

Like *D. r. adamsoni* in its general characteristics, but darker and richer in colour throughout.

Size slightly larger than in *adamsoni*. General colour of back more suffused with rufous, not such a clear olive grey. Posterior back and hips suffused with ferruginous instead of the lighter and more buffy suffusion of *adamsoni*. Muzzle deep ferruginous, this colour extending well up to the forehead: crown mixed ferruginous and black, as compared with the grey crown of *adamsoni*. Postauricular patch white, much larger and more conspicuous than in the allied form.

Skull somewhat larger than in *adamsoni*, but of about the same shape.

Dimensions of the type:—Head and body, 210 mm.; tail, 174; hindfoot, 50; ear, 21. Skull:—Greatest length, 55.

Habitat.—Hkamti, Upper Chindwin, East bank. Alt. 500'.

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Type.—Adult male. B.M. No. 15.5.5.195. Original number 5,817. Collected 25th July 1914. Five specimens.

Dremomys macmillani, sp. n.

A black median dorsal stripe. No rufous on cheeks or along underside of tail.

Size about as in *D. lokriah*. General colour above dark coarsely grizzled olive-grey, clearer on fore-back, suffused with dull tawny on crown, nape, and hind-back; a distinct narrow black median line present on the clearer grey part from the back of the nape to the loins. Flanks grizzled olive grey. Undersurface bright buffy, lighter anteriorly and on the inner side of the fore-limbs, darkening to cinnamon buff on the inner side of the hind limbs. The hairs with little or no slaty at their bases. A tendency to the presence of irregular white patches or lines on the centre of the chest. Anal region and base of tail beneath rich ochraceous-rufous. Cheeks like face, not rufous. Postauricular patches prominent, deep ochraceous buffy. Hands and feet mixed grey and buffy. Tail hairs ringed with black and pale buffy, their tips white; no rufous band extending along the underside of the tail, as in some species; tip of tail not specially blackened.

Skull about like that of *D. lokriah*, except that the base of the muzzle is a little broader, so that the re-entrant angle on each side is a little less marked.

Dimensions of the type:—Head and body, 180 mm.; tail, 156; hindfoot, 46; ear, 20.

Skull: greatest length, 50·3; condylo-incisive length, 44·8; zygomatic breadth, 27·7; nasals, 15.5; interorbital breadth, 14·8; palatilar length, 21; upper tooth series exclusive of $p.^3$ 8·3.

Habitat.—Upper Chindwin and Manipur. Type from Tatkon, on West bank of Chindwin near Kindat. Another specimen from Let Syaw, near Kabaw Valley, alt. 3,000′; and a third from Tsibet, East Manipur, 5,000′.

Type.—Adult male. B.M. No. 15.5.5.198. Original number 5,537. Collected 27th June 1914.

In the synopsis of the species of *Dremomys* that Thomas published in the Journal some years ago * this most distinct squirrel would come next to *D. lokriah*, with which it agrees in the characters there referred to. But it is readily distinguishable by its distinct dorsal black line, its greyer general colour, the more completely buffy hairs of the underside, and by the greater prominence and buffy colour of the postauricular patches.

We have connected with this species the name of the late Capt. S. A. Macmillan, who accompanied and assisted Mr. Shortridge on his Chindwin trip. At the conclusion of that trip both men

* Journ. Bomb. N. H. Soc. xviii, p. 249, 1908.

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volunteered for service at the front, and received commissions. Capt. Macmillan was wounded while leading his company into action and died of his wounds on the 9th May 1915. His death will be a great loss to the Survey.

Tamiops macclellandii, Horsf.

19 specimens referable to *T. macclellandii* were obtained during the Chindwin expedition.

Of these, 16, collected down the East bank of the river from Hkamti to Homalin, may be provisionally referred to true *macclellandii*, while the other three, from the Chin Hills, appear to represent *T. m. manipurensis*, Bonh.

Further study of both forms however is needed, both with regard to their geographical range and seasonal variation, on which latter point material is sadly lacking.

Persons living in the areas where these beautiful little squirrels are found would do a great service by collecting series of them all round the year—say, two every month—so that a thoroughly sound idea could be gained as to the seasonal changes they undergo.

B.—Notes on the genus *Cremnomys*.

By Oldfield Thomas.

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The Rock-rats of the genus *Cremnomys* afford a striking instance of the increase of our knowledge and material due to the work of the Bombay Survey. None of these Rock-rats had ever been obtained at all by any Indian naturalist until the survey collector Mr. Crump got a small series in Cutch in 1911, on which Mr. Wroughton described the genus.

Now, there are available for examination no less than 238 specimens, representing, each with fair series, eight localities, from Cutch and Kathiawar in the North-west, Hazaribagh in the North-east, to Bellary and Seringapatam in the South, a range which makes it most astonishing that no *Cremnomys* had been found before 1911. The explanation is no doubt that these rats can only be obtained by systematic trapping, and so do not fall into the hands of the casual naturalist, who trusts to his gun and to natives for what mammals he gets. *Cremnomys* cannot be dug out, owing to the rocky nature of their habitat and so are never captured by natives.

Inhabiting as they do groups of rocky hills more or less isolated from each other, it is natural to find a certain amount of local difference between the specimens from different localities, and I have therefore now divided the series into three species, and these

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again into sub-species. The characters are however not very important, and some variation is observable in them. But these variations must to a certain extent be ignored unless we are unintelligently to lump the whole series together, and so close our eyes to the unquestionable local differentiation that exists.

1. *Cremnomys cutchicus*, Wrought.

Size little if any less than in the other species, but feet distinctly smaller, only 23, 24 or 25 mm. in length. Molars 5·2 to 5·4 mm. Skull usually about 33 mm. in length. Colour above rather pale, more buffy, less clear grey than in *australis*; below the usual condition is that the hairs of the sides of the belly are grey-based, those of the middle line white throughout. As a consequence the undersurface is whiter than in *medius*, not so white as in *australis*. Supraorbital crests delicate.

Habitat.—Cutch only, the *Cremnomys* of Kathiawar being *C. medius*. 34 specimens collected.

The small feet of this species distinguish it from the other members of the genus. In colour, as might be expected from the local conditions, it approaches *C. australis* of the equally dry Bellary area, but is not so extreme.

2. *Cremnomys medius*, sp. n.

Size averaging largest of the genus, hindfeet 26, 27, or 28 mm. in length. Molars 5·4—5·7 mm. Skull, 34—35 mm. in greatest length. Colour comparatively dark above. Below, the hairs are generally all grey-based, resulting in a blue-grey tone. Ears averaging rather larger than in *C. australis*. Supraorbital crests generally heavier than in *cutchicus*, lighter than in *australis*.

Range.—From Kathiawar, Gujarat and S. Rajputana across to Bihar and Orissa.

SUB-SPECIES.

2-a. *Cremnomys medius medius.*

Fur rather short. General colour above comparatively dark, wood-brown darkened by the black ends to the hairs. Head little greyer. No specially marked nuchal patch. Undersurface blue-grey throughout.

Dimensions of the type, measured in the flesh :—

Head and body 124 mm.; tail 148; hindfoot 27; ear 20.

Skull, greatest length 35; condylo-incisive length 30·7; zygomatic breadth 16·5; nasals 14·7; interorbital breadth 5·2; upper molar series 5·4.

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Habitat.—Kathiawar and Gujarat. Type from Kudia, Junagadh, Kathiawar. Alt. 2,500.

Type.—Adult female. B. M. No. 13. 8. 8. 128. Original number 2042. Collected 30th November 1912 by C. A. Crump.

Presented to the National Museum by the Bombay Natural History Society, as are also the other types mentioned below, together with representative series of each form. 43 specimens.

2-b. *Cremnomys medius rajput*, sp. n.

Proportions about as in *C. m. medius*. Fur long; rather thin. General colour paler, the fore-back fawn grey passing posteriorly into bright "pinkish buff" more or less lined with blackish; sides also prominently pinkish buff. A buffy patch generally present across the nape and back of the ears, contrasting with the more greyish general colour of the crown and fore-back. Undersurface greyish white, the grey more overlaid with white than in true *medius*, and sometimes almost absent.

Dimensions of the type:—

Head and body 126 mm.; tail 166; hindfoot 27; ear 20.

Skull, greatest length 35·4; condylo-incisive length 31·3; zygomatic breadth 17·2; nasals 15; interorbital breadth 5·2; upper molar series 5·6.

Habitat.—Mt. Abu, Rajputana. Alt. 4,300.

Type.—Old female. B. M. No. 13·9. 18·40. Original number 3357. Collected 1st June 1913 by C. A. Crump. 60 specimens.

Although on the map Mt. Abu appears comparatively near to the localities where *C. m. medius* was obtained, Mr. Wroughton tells me that it is really quite isolated, and that the occurrence there of a distinct form of Rock-rat is not unnatural. Certainly the buffy coloration of the hind-back and nuchal patch appears distinctive.

2-c. *Cremnomys medius caenosus*, subsp. n.

Fur thin and poor. Colour dark mouse-grey, grey above, bleaching to dull tawny on the hinder-back; no perceptible nuchal patch. Undersurface dirty greyish, the slaty bases of the hairs little hidden by their white tips.

Dimensions of the type:—

Head and body 125 mm.; tail 157; hindfoot 28; ear 21.

Skull, greatest length 35·1; condylo-incisive length 30·4; zygomatic breadth 17; nasals 14·5; interorbital breadth 5; upper molar series 5·6.

Habitat.—Bihar and Orissa. Type from Singar, Gaya, 1,400′, others pecimens from Gujhundi, Hazaribagh, 1,000′.

Type.—Adult male. B. M. No. 15. 4. 3. 137. Original number 5027. Collected 30th May 1914 by C. A. Crump. 8 specimens.

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This dull coloured form, from the dark soil of what used to be Western Bengal, occurs more than 700 miles away from its Gujerat ally, no member of the genus having as yet been found in the intervening area.

3. *Cremnomys australis*, sp. n.

Size about as in *C. medius* or a little less, but the feet rather longer in proportion. Molars small, the series 5·0-5·4 mm. Colour pale buffy grey above, pure white below, the hairs either all white to their roots, or grey-based just along the sides of the belly. Ears averaging rather shorter than in *C. medius*. Supraorbital crests comparatively thick and solid, with perceptible postorbital angle.

Range.—Bellary and Mysore.

SUB-SPECIES.

3-a. *Cremnomys australis australis.*

Colour above pale buffy grey, the crown and fore-back greyer ("drab-grey"), the nape and hind-back more buffy, but the contrasts little marked. Sides greyer, not buffy. Undersurface pure sharply defined snowy white, the hairs mostly white to their roots.

Dimensions of the type:—

Head and body 127 mm.; tail 169; hindfoot 27; ear 18·5.

Skull, greatest length 34·3; condylo-incisive length 30·5; zygomatic breadth 16·7; nasals 14·3; breadth of brain-case 14·4; upper molar series 5·3.

Habitat.—Bellary (Type from Vijayanagar 1,500′) and E. Mysore (Kolar Town 3,000′).

Type.—Old female. B. M. No. 13. 4. 10. 57. Original number 1633. Collected 10th August 1912 by G. C. Shortridge. 63 specimens.

This beautiful form is readily distinguishable by its pale grey colour and snowy belly.

3-b. *Cremnomys australis siva*, subsp. n.

Slightly larger than *C. australis australis*, hindfoot 28—29 mm. Colour above rather a darker grey than in that form (near "mouse grey" of Ridgway). Undersurface white, but not so sharply defined or so snowy a white as in *australis*, the hairs on the chest and sides of the belly commonly with grey bases.

Dimensions of the type:—

Head and body 149 mm.; tail 159; hindfoot 29; ear 19.

Skull, greatest length 34·7; condylo-incisive length 30·4; zygomatic breadth 15·8; nasals 15; breadth of brain-case 14·2; upper molar series 5·4.

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Habitat.—South Mysore. Type from Sivasamudram 2,500′, others from French Rocks, near Seringapatam, 2,600′.

Type.—Adult male. B. M. No. 13. 4. 11. 78. Original number 2125. Collected 25th November 1912 by G. C. Shortridge. 30 specimens.

While *australis* is pale and snowy-bellied in correlation with the extreme dryness of the Bellary and E. Mysore area, the present form, nearer the Western Ghats, and therefore in a more rainy district, is darker in general colour, and its belly is less completely white. Its feet are the longest found in the genus.

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A LIST OF THE NATURAL ORDERS AND GENERA OF BOMBAY PLANTS WITH DERIVATIONS OF THE NAMES.

BY

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Some Floras give derivations of the generic and specific names of plants mentioned therein. None of the Bombay Floras do it. Botanical names however derived are latinised and are regarded by most men as very dry and uninviting, like specimens of plants in a herbarium. If derivations were known, the names would be invested with quite an unsuspected interest. Besides, in many cases it helps memory by presenting an association between the name and the plant.

Genera are grouped into natural orders. In the Bombay Presidency there are a hundred and forty-one indigenous orders, and nearly a score more having introduced representatives only. Of the indigenous orders, as many as close upon a hundred have genera that are cultivated for use or ornament. I have given derivations of the names of the natural orders as well as of the genera. Of genera, we have very close upon a thousand that are indigenous, and another five hundred that are represented by introduced species alone. Some three hundred of the thousand indigenous genera have cultivated species also. Thus we have altogether about eight hundred genera that are grown by farmers or gardeners in the Bombay Presidency. Their names should interest a wider circle than that of botanists proper. Some of these names have, besides, very interesting derivations as will be seen further on.

A natural order takes its name after its typical genus as a rule. Lindley (1846) had reduced this to a uniform system. He called Compositæ, Asteraceæ; Cruciferæ, Brassicaceæ and so on. Lindley's plan is not followed nor, in my opinion, is it desirable. Of the over hundred and fifty natural orders listed here, there are, however, not more than a dozen that are not named after a genus. These are generally named after some common point in morphology. Thus Coniferæ and Leguminosæ are named after the types of fruits commonly met with in these orders. Labiatæ and Cruciferæ are related to the corolla-forms occurring in them. Lastly, Compositæ and Umbelliferæ draw our attention to the forms of their inflorescence.

The generic names are derived in a variety of ways. Most of them are descriptive. The descriptions are largely morphological. Sometimes they indicate supposed or real medicinal and other properties or uses of the plants.

At other times they describe the habitat. A few names are geographical. Quite a large number of names are commemorative. These are connected chiefly with botanists, their patrons, friends or foes. A few generic names in botany are derived from Greek and Roman mythology. Hindu mythology, which has supplied so many Insect names, does not give origin to any Plant names. Another large stock of scientific names is derived from ancient or modern common names of plants used in some part of the world.

The descriptive names show great variety. A large number of them are vague, such as Abrus, Cleome, Cyclea, Eurya, Melaleuca, Orophea, and Tylophora.* They do not state what is soft, close set, circular, large, black

* For the derivations of these and other names that follow, as well as the aptness of the names, see the main list further down.

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and white, topmost or tubercular. As flowers often appeal to our æsthetic sense, we get names like Gloriosa, Asphodelus, Bellis, Eucharis, and so on. Such names refute, by the way, the charge against botanists of their being dead to the æsthetic aspect of plant life. Other descriptions are more precise. They refer to some particular part of the plant. In this group a large number refer to the flower. For instance, Anthemis, Cherianthus, Helianthus, Plectranthus, and Strophanthus. Others describe the inflorescence, like Dichrostachys and Stachytarpheta. Yet others describe a particular part of the flower such as calyx, corolla, stamens and pistil or their subdivisions. The following are among the names so derived:— Calycopteris, Dimorphocalyx ; Bursinopetalum ; Crossandra, Andrographis ; Anisonema ; Centratherum, Platanthera ; Gynocardia, Mitragyne ; Rhynchostylis, Stylosanthes ; Stigmaphyllon and Streptostigma. The fruit and seeds have a fair share of names after them. Thus we have Alysicarpus, Psophocarpus, Semecarpus ; Baliospermum, Diccœlospermum, Gymnosporia* and Pittosporum. The vegetative parts like the root, the shoot and the leaf contribute names like the following to indicate peculiarities in these parts of the plant. Acanthorhiza, Rhizophora ; Chloroxylon, Myroxylon ; Eriocaulon ; Ancistrocladus ; Allophylus, Bulbophyllum, and Graptophyllum. Structures of a lesser morphological importance like the wing, the corona, or the gland are referred to in names like Aspidopteris, Sarcostemma, Dicoma and Leptadenia. On scanning the list of Bombay genera for the names after colours, we get names like Beta, Coccinia, Erythrina, Flaveria, Melastoma, Rubia and Xanthium. Another interesting collection of names could be made by bringing together all names containing a numerical reference. We then come across names like Decaneurum, Enneapogon, Haplanthus Monochoria, Trias and Trigonella.

Of descriptive names relating the properties or uses, we have a rather limited number, but every one of them is interesting. A collection of this as well as other groups of names will be found at the end of this paper. It may be observed here in passing that in spite of Panax we are still without a panacea, and persons die of snake bites though we have Ophioxylon. On the other hand, we have Piscidia, Sapindus and Theobroma that well come upto their professions, and Artocarpus is a veritable bread-fruit in some parts of the world. The names after the habitat are almost always correctly applicable. As examples I should select Halocharis, Heleocharis, Hygrophila, Limnanthemum and Salsola. A glance at the numerous ponds in the Bombay Presidency towards the end of the monsoons would convince any one that Limnanthemum is the flower of our ponds. A large group of descriptive names embodies some comparison. The comparison is made with other plants, or with animals, or with some familiar inanimate object around us. In the first set we get names like Cissampelos, Filicium, Nothopegia and Asparagopsis. The second set yields names like Cocos, Croton, Cynodon, Geranium, Leonotis, Mimusops, Orchis, Ricinus and Tragus. It requires a vivid imagination to realise the resemblance fancied by the botanical authors of these names. The comparison is closer in the third set of names, though monkeys, cranes, lions and goats are nearer plants than rattles, tiles, lamps and ships to which our attention is invited by Crotalaria, Geissaspis, Lychnis and Nauclea.

Geographical names are not much used to express genera. They are more largely used to form the specific names. Nor are they easy of recognition. Thus, few would suspect the well known city of Ujjain hidden behind Ougeinia. It is easier to see Aden in Adenium. Other names of

* A somewhat misleading name, as it does not belong to the Gymnosperms.

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interest in this group are Carica, Citrus, Iberis, Medicago, Moringa, Sapindus and Tamarindus. We referred above to Sapindus when speaking of 'property names.' We come across it again under 'geographical names' as it means the soap of India. Many plant names are thus compounded and convey more than one idea. Dendrochilum is another name of this type. We gather from this name that here is an epiphyte bearing lipped flowers. The first part of the name refers to the habitat; the second part is morphological.

We now come to the very large class of commemorative names. These names tell us less about the plants themselves than those that we have noticed so far, but they unfold before us a chapter in the history of botany. Thus, the very name tells us that "Victoria regia" was named while Queen Victoria was ruling. Gibsonia recalls to our minds our local botanists,* Dalzell and Gibson. Wight named a new Orchrid Josephia to do honour to Sir Joseph Dalton Hooker, when he probably found that Hooker already enters into several names both by itself and in combination—Hookera, Hookerella Hookerina, and Hookerisideroxylon. Sir Bartle Frere, one of the Governors of Bombay,† is immortalised in "Frerea." When persons are commemorated it is but natural to find that personalities in every sense are referred to. These names not only serve to do honour but also to express satire. Thus Buffonia tenuifolia is a well known satire on the slender botanical pretentions of the great French Zoologist. Bauhinia is expressive in yet another way. Here plants with two-lobed leaves are selected to commemorate two botanists, the brothers Bauhin, John and Caspar. Any one who has seen the "Apta" or "Jinji" leaves can well realise how apt the name is. In 'mythological names' such a connection between the name and the plant is yet more interesting. In Baccauria after Baccus the apt allusion is to the golden coloured berries. We are reminded of the sea-god by an aquatic plant, Neptunia. The lovely Nymphæa of our tanks could not have a more appropriate name. Is it not befitting that Oberon should live in the orchid "Oberonia"? Lastly, a whole mythological incident may be recalled by a short botanical name. Thus "Centauria" is said to have cured a wound in the foot of Centaur Chiron caused by an arrow of Hercules.

A large group of names still remains to be discussed before we have done with the generic names of Bombay plants. This is built up of common names of plants that are latinised to acquire the scientific form. They are ancient as well as modern, belong to all languages, dead and living, and come from every quarter of the globe. Considerable scholarship must be expended before we can get the full import of the names in this group. Here are some of them. Ficus, Gossypium, Vitis and Zea—these are old Greek or Latin names. Carissa, Datura, and Putranjiva are Sanskrit. Aloe, Calamus (kalam) Cinnamomum, Jasminum, Limonia (Limboo), Santalum (Sandalwood), and Senna are Arabic or Persian. Bambusa, Cajanus and Canavalia are Malay names. Ananas, Batatas and Petunia are American names. Occasionally translations of vernacular names of plants are adopted as generic names. Pithecolobium and Ophiopogon are translations of Malabar and Japanese names, respectively.

Other processes of manufacturing botanical names are illustrated by the following. Anagrams have been occasionally availed of by botanists. Galphimia is an anagram of Malpighia and Pycreus is of Cyperus. The name Quisqualis (Rangoon-creeper) points to the uncertainty as to what

* For an account of Bombay botanists, see Vol. XVII, p. 562 and ff. of the Journal of the Bombay Natural History Society; for Indian botanists, see the "Introductory Essay to the Flora Indica" by Hooker and Thomson.

† Born 1815, died 1884; Governor of Bombay, 1862—1867.

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class or order the genus belonged to when it was discovered or named. Another miscellaneous type of names is that of fanciful names. Zephyranthes is an example of it. Sometimes two different names are formed out of the same words by using them in different sequence. Examples from the Bombay flora are afforded by Cissampelos and Ampelocissus. Some names differ very slightly and their use requires careful attention. Kæmpferia and Kæmpfera, Maba and Mabea, Sebastiania and Sebastiana* are some of these confusing pairs. Lastly, I would refer here to the fact that the same name is used by more than one author to designate different plants. Arthraxon is a member of the order Gramineæ and also of Loranthaceæ. Manisuris stands for two different genera of Gramineæ. In such cases the author's name is added to avoid confusion. Conversely, one and the same genus has more than one name. This has necessitated the formulation of the rule of priority, and introduced a host of synonyms in botanical nomenclature.

The plan of binomial nomenclature which is universally adopted in Botany and Zoology originated with Linnæus, or as he preferred to be known Linneus. Before his time, the names of plants generally consisted of three words, and these were frequently followed by some more. Thus Bidens pilosa was Bidens latifolia hirsutior semine angustiore radiato before Linnæus. I close this introduction with the canons on scientific nomenclature in botany drawn up by Linnæus.† The list‡ of Bombay genera that follows illustrates how far these canons are observed in the formation of generic names in botany.

1. The names of plants are of two kinds: those of the class and order, which are understood; and those of the genus and species, which are expressed. The names of the class and order never enter into the denominations of a plant.
2. All plants agreeing in genus are to have the same generic name.
3. All plants differing in genus are to have a distinct generic name.
4. Each generic name must be single.
5. Two different genera cannot be designated by the same name.
6. It is the business of those who distinguish new genera to name them.
7. Generic names derived from barbarous languages ought on no account to be admitted.
8. Generic names compounded of two entire words are improper, and ought to be excluded. Thus Vitis-Idæa must give way to Vaccinium, and Crista-Galli to Rhinanthus.
9. Generic names formed of two Latin words are scarcely tolerable. Some of them have been admitted, such as Cornu*copiæ*, Ros*marinus*, Sempervivum, &c., but these examples are not to be imitated.
10. Generic names formed half of Latin and half of Greek are hybrid, and on no account to be admitted; such as Cardam*indum*, Chrysanthem*indum*, &c.
11. Generic names compounded of the entire generic name of one plant, and a portion of that of another, are unworthy of Botany; Cann*acorus*, Lilio*narcissus*, Lauro*cerasus*.
12. A generic name, to which is prefixed one or more syllables, so as to alter its signification, and render it applicable to other plants is not admissible; as *Bulbo*castanum, *Cyno*crambe, *Chamæ*nerium.

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* These belong to the orders Zingiberaceæ, Verbenaceæ, Ebenaceæ, Euphorbiaceæ, Euphorbiaceæ and Compositæ, respectively.

† I have taken these from R. H. Alcock's Botanical Names for English Readers, London, 1876, pp. 64—66.

‡ See pp. 262 *et. seq.*

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13. Generic names ending in "oides" are to be rejected; as Agrimon*oides*, Aster*oides*, &c.

14. Generic names formed of other generic names, with the addition of some final syllable, are disagreeable, as Aceto*sella*, Balsam*ita* Rap*istrum*, &c.

15. Generic names sounding alike lead to confusion.

16. No generic names can be admitted except such as are derived from either the Greek or Latin languages.

17.. Generic names appertaining previously to Zoology, or other Sciences, are to be cancelled, if subsequently applied in Botany.

18. Generic names at variance with the characters of any of the species are bad.

19. Generic names the same as those of the class or order cannot be tolerated.

20. Adjective generic names are not so good as substantive ones, but may be admitted.

21. Generic names ought not to be misapplied to gaining the goodwill or favour of saints or persons celebrated in other sciences; they are the only reward that the botanist can expect, and are intended for him alone.

22. Nevertheless, ancient poetical names of deities or of great promoters of the Sciences are worthy of being retained.

23. Generic names that express the essential character or habit of a plant are the best of all.

24. The ancient names of the classics are to be respected.

25. We have no right to alter an ancient generic name to one more modern, even though it may be for the better; this would in the first place be an endless labour, and in the next place would tend to inextricable confusion.

26. If new generic names are wanted it must first be ascertained whether no one among the existing synonyms is applicable.

27. If an old genus is divided into several new ones the old name will remain with the species that is best known.

28. The termination and euphony of generic names are to be consulted as far as practicable.

29. Long, awkward, disagreeable names are to be avoided, as Calophyllodendron of Vaillant, Coriotragematodendros of Plukenet, and the like*.

30. The names of classes and orders are subject to the same rules as those of genera. They ought always to express some essential and characteristic marks.

31. The names of both classes and orders must always consist of a single word, and not of sentences.

The Natural Orders of Bombay Plants with Derivations of the Names.

The nomenclature and limits of the orders adopted by me are those of Cooke's Bombay Flora for obvious reasons. The difference in this respect between Cooke's work and Engler and Prantl's Pflanzenfamilien may, however, be noted here. A few orders change names. Chailletiaceæ,

* The shortest of generic names of Bombay plants are Zea and Poa, and of the world's flora Aa, Rchb. f., Orchid. and Zaa, H. Baill., Bignon. Of long names, we have in Bombay Mesembryanthemum, Pseudanthistiria, Tabernæmontana, Amorphophallus and so on, and in the world Calycogoniopsis Cogn. Melastom, Euphœnicanthemum von Tiegh. Loranth., Pseudohermbstædtia Schinz. Amarant. and so on.

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Ficoidaceæ, Ilicaceæ and Samydaceæ of Cooke are Dichapetalaceæ, Aizoaceæ, Aquifoliaceæ and Flacourtiaceæ respectively of Engler and Prantl. And Boraginaceæ, Haloragidaceæ and Malphigiaceæ* of the former are Borraginaceæ, Halorrhagidaceæ and Malpighiaceæ of the latter. Then there are differences in the limits of the orders between the two. Fumariaceæ, Hypericaceæ and Illecebraceæ appear in Cooke as independent orders. In the other work they are subordinated under Papaveraceæ, Guttiferæ and Caryophyllaceæ, respectively. A large number of independent orders of Engler and Prantl, on the other hand, are similarly subordinated in Cooke as shown in the table further on.

There are also many transfers of genera from one order to another. Thus Sansevieria and Ophiopogon are found under Hæmodoraceæ in Cooke, while in Engler and Prantl they are given under Liliaceæ‡. The sequence of the natural orders in the two works is entirely different. The sequence represents the view taken of the affinities of plants, and as such is of the greatest consideration. I give further below the sequence of orders of Cooke (based as it is on that of Bentham and Hooker) and of Engler and Prantl. Only those orders are mentioned that include Bombay genera, whether indigenous or introduced.

Independent Orders of Engler and Prantl.	*Orders of Cooke in which they are incorporated.*
Aponogetonaceæ	Naiadaceæ.
Balsaminaceæ	Geraniaceæ.
Bombacaceæ	Malvaceæ.
Basellaceæ	Chenopodiaceæ.
Butomaceæ	Alismaceæ.
Cannaceæ	Scitamineæ.
Caricaceæ	Passifloraceæ.
Elæocarpaceæ	Tiliaceæ.
Hernandiaceæ	Combretaceæ.
Hippocrateaceæ..	Celastraceæ.
Hydrocaryaceæ..	Onagraceæ.
Lecythedaceæ	Myrtaceæ.
Marantaceæ	Scitamineæ.
Martyniaceæ	Pedaliaceæ.
Moraceæ	Urticaceæ.
Musaceæ	Scitamineæ.
Oxalidaceæ	Geraniaceæ.
Potamogetonaceæ	Naiadaceæ.
Punicaceæ	Lythraceæ.
Sonneratiaceæ	Lythraceæ.
Staphyleaceæ	Sapindaceæ.
Symplocaceæ	Styracaceæ.

* A misprint, I believe.

‡ The following table gives all the transfers of genera from one order to another that are met with.

Genus.	*Order in Engler and Prantl.*	*Order in Cooke, i.e., in Bentham & Hooker.*
Balanite ...	Zygophyllaceæ	Simarubæ.
Giseckia	Phytolaccaceæ	Ficoideæ.
Limeum	Do.	Do.
Ophiopogon ...	Liliaceæ	Hæmodoraceæ.
Peliosanthes ...	Do.	Do.
Sansevieria ...	Do.	Do.
Spathelia ...	Rutaceæ	Simarubæ.

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*Bombay Orders as arranged in Cooke's Flora.**

Ranunculaceæ	Rutaceæ	Begoniaceæ	Scrophulariaceæ	Gnetaceæ
Dilleniaceæ	Simarubaceæ	Datiscaceæ	Orobanchaceæ	*Coniferæ*
Magnoliaceæ	Ochnaceæ	*Cactaceæ*	Lentibulariaceæ	*Cycadaceæ*
Anonaceæ	Burseraceæ	Ficoideæ	Gesneriaceæ	Hydrocharitaceæ
Menispermaceæ	Meliaceæ	Umbelliferæ	Bignoniaceæ	Burmanniaceæ
Berberidaceæ	Chailletiaceæ	Araliaceæ	Pedaliaceæ	Orchidaceæ
Nymphæaceæ	Olacaceæ	Cornaceæ	Acanthaceæ	Scitamineæ
Papaveraceæ	Ilicaceæ	*Caprifoliaceæ*	Verbenaceæ	*Bromeliaceæ*
Fumariaceæ	Celastraceæ	Rubiaceæ	Labiatæ	Hæmodoraceæ
Cruciferæ	Rhamnaceæ	*Valerianaceæ*	Plantaginaceæ	*Irideæ.*
Capparidaceæ	Vitaceæ	*Dipsaceæ*	Nyctaginaceæ	Amaryllidaceæ
Resedaceæ	Sapindaceæ	Compositæ	Illecebraceæ	Taccaceæ
Violaceæ	Sabiaceæ	Goodeniaceæ	Amarantaceæ	Dioscoreaceæ
Bixaceæ	Anacardiaceæ	Campanulaceæ	Chenopodiaceæ	Liliaceæ
Pittosporaceæ	Moringaceæ	*Ericaceæ*	*Phytolaccaceæ*	Pontederiaceæ
Polygalaceæ	Connaraceæ	Plumbaginaceæ	Polygonaceæ	Xyridaceæ
Caryophyllaceæ	Leguminosæ	Primulaceæ	Podostemonaceæ	Commelinaceæ
Portulacaceæ	Rosaceæ	Myrsinaceæ	Aristolochiaceæ	Flagellariaceæ
Tamaricaceæ	Saxifragaceæ	Sapotaceæ	Piperaceæ	Juncaceæ
Elatinaceæ	Crassulaceæ	Ebenaceæ	Myristicaceæ	Palmæ
Hypericaceæ	Droseraceæ	Styracaceæ	Lauraceæ	Pandanaceæ
Guttiferæ	Haloragidaceæ	Oleaceæ	*Proteaceæ*	*Cyclanthaceæ* Typhaceæ
Ternstrœmiaceæ	Rhizophoraceæ	Salvadoraceæ	Thymelæaceæ	Araceæ
Dipterocarpaceæ	Combretaceæ	Apocynaceæ	Elæagnaceæ	Lemnaceæ
Ancistrocladaceæ	Myrtaceæ	Asclepiadaceæ	Loranthaceæ	Alismaceæ
Malvaceæ	Melastomaceæ	Loganiaceæ	Santalaceæ	Naiadaceæ
Sterculiaceæ	Lythraceæ	Gentianaceæ	Balanophoraceæ	Eriocaulaceæ
Tiliaceæ	Onagraceæ	*Polemoniaceæ*	Euphorbiaceæ	Cyperaceæ
Linaceæ	Samydaceæ	Hydrophyllaceæ	Urticaceæ	Gramineæ
Malpighiaceæ	*Turneraceæ*	Boraginaceæ	*Casuarinaceæ*	
Zygophyllaceæ	Passifloraceæ	Convolvulaceæ	Salicaceæ	
Geraniaceæ	Cucurbitaceæ	Solanaceæ	Ceratophyllaceæ	

* The names of introduced orders are given in *italics*.

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*Bombay Orders arranged in accordance with Engler and Prantl's Pflanzen-familian.**

Cycadaceæ	Piperaceæ	Crassulaceæ	Ochnaceæ	Primulaceæ
Pinaceæ	Salicaceæ	Saxifragaceæ	Theaceæ	Plumbaginaceæ
Gnetaceæ	Moraceæ	Pittosporaceæ	Guttiferæ	Sapotaceæ
Typhaceæ	Urticaceæ	Rosaceæ	Dipterocarpaceæ	Ebenaceæ
Pandanaceæ	*Proteaceæ*	Connaraceæ	Elatinaceæ	Symplocaceæ
Potamogetonaceæ	Loranthaceæ	Leguminosæ	Tamaricaceæ	Oleaceæ
Najadaceæ	Santalaceæ	Geraniaceæ	Bixaceæ	Salvadoraceæ
Aponogetonaceæ	Olacaceæ	Oxalidaceæ	*Canellaceæ*	Loganiaceæ
Alismaceæ	Balanophoraceæ	Tropæolaceæ	Violaceæ	Gentianaceæ
Butomaceæ	Aristolochiaceæ	Linaceæ	Flacourtiaceæ	Apocynaceæ
Hydrocharitaceæ	Polygonaceæ	*Erythroxylaceæ*	*Turneraceæ*	Asclepiadaceæ
Gramineæ	Chenopodiaceæ	Zygophyllaceæ	Passifloraceæ	Convolvulaceæ
Cyperaceæ	Amarantaceæ	Rutaceæ	Caricaceæ	*Polemoniaceæ*
Palmæ	Nyctaginaceæ	Simarubaceæ	Datiscaceæ	Hydrophyllaceæ
Cyclanthaceæ	*Phytolaccaceæ*	Burseraceæ	Begoniaceæ	Borraginaceæ
Araceæ	Aizoaceæ	Meliaceæ	Ancistrocladaceæ	Verbenaceæ
Lemnaceæ	Portulacaceæ	Malpighiaceæ	*Cactaceæ*	Labiatæ
Flagellariaceæ	Basellaceæ	Polygalaceæ	Thymelæaceæ	Solanaceæ
Xyridaceæ	Caryophyllaceæ	Dichapetalaceæ	Elæagnaceæ	Scrophulariaceæ
Eriocaulonaceæ	Nymphæaceæ	Euphorbiaceæ	Lythraceæ	Bignoniaceæ
Bromeliaceæ	Ceratophyllaceæ	Anacardiaceæ	Sonneratiaceæ	Pedaliaceæ
Commelinaceæ	Ranunculaceæ	Aquifoliaceæ	Punicaceæ	Martyniaceæ
Pontederiaceæ	*Berberidaceæ*	Celastraceæ	Lecythidaceæ	Orobanchaceæ
Juncaceæ	Menispermaceæ	Hippocratiaceæ	Rhizophoraceæ	Gesneriaceæ
Liliaceæ	*Magnoliaceæ*	Staphyliaceæ	Combretaceæ	Lentibulariaceæ
Amaryllidaceæ	Anonaceæ	Sapindaceæ	Myrtaceæ	Acanthaceæ
Taccaceæ	Myristicaceæ	Sabiaceæ	Melastomaceæ	Plantaginaceæ
Dioscoreaceæ	Lauraceæ	Balsaminaceæ	Onagraceæ	Rubiaceæ
Iridaceæ	Hernandiaceæ	Rhamnaceæ	Hydrocaryaceæ	*Caprifoliaceæ*
Musaceæ	Papaveraceæ	Vitaceæ	Halorrhagidaceæ	*Valerianaceæ*
Zingiberaceæ	Cruciferæ	Elæocarpaceæ	Araliaceæ	*Dipsacaceæ*
Cannaceæ	Capparidaceæ	Tiliaceæ	Umbelliferæ	Cucurbitaceæ
Marantaceæ	Resedaceæ	Malvaceæ	Cornaceæ	Campanulaceæ
Burmanniaceæ	Moringaceæ	Bombacaceæ	*Ericaceæ*	Goodeniaceæ
Orchidaceæ	Droseraceæ	Sterculiaceæ	Myrsinaceæ	Compositæ
Casuarinaceæ	Podostemonaceæ	Dilleniaceæ		

THE NATURAL ORDERS OF BOMBAY PLANTS WITH DERIVATIONS OF THE NAMES.

This list includes the indigenous as well as introduced natural orders. The latter are printed in *italics* to distinguish them from the former. Most of the indigenous orders have cultivated representatives. Those that have not any species of theirs cultivated in the Bombay Presidency have a † placed after them.

Acanthaceæ .. genus Acanthus, *q. v.*
Alismaceæ † .. genus Alisma: Celtic *alis*, water.—N.
Amarantaceæ .. genus Amarantus, *q. v.*
Amaryllidaceæ .. genus Amaryllis: the name of a countrywoman mentioned by Theocritus and Virgil.—N.
Anacardiaceæ .. genus Anarcardium, *q. v.*
Ancistrocladaceæ † .. genus Ancistrocladus, *q. v.*
Anonaceæ .. genus Anona, *q. v.*
Apocynaceæ .. genus Apocynum; adopted by Dioscorides because the plant was supposed to be poisonous to dogs.—N.
Araceæ .. genus Arum: the ancient name of these plants.—B.
Araliaceæ .. genus Aralia: meaning unknown.—N.

*The names of introduced orders are given in *italics*.

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Aristolochiaceæ	..	genus Aristolochia, *q. v.*
Asclepiadaceæ	..	genus Asclepias, *q. v.*
Balanophoraceæ †	..	genus Balanophora: bearing acorns (balanos)—N.
Begoniaceæ	..	genus Begonia, *q. v.*
Berberidaceæ	..	genus Berberis: from Arabic *Berberys*.—B.
Bignoniaceæ	..	genus Bignonia, *q. v.*
Bixaceæ	..	genus Bixa: its South American name.—N.
Boraginaceæ * *	..	genus Borago: derivation very uncertain.—N.
Bromeliaceæ	..	genus Bromelia; after BROMEL, a Swedish botanist.—N.
Burmanniaceæ †	..	genus Burmannia, *q. v.*
Burseraceæ	..	genus Bursera: from J. BURSER, disciple of Caspar Bauhin.—N.
Cactaceæ	..	genus Cactus: a name used by the ancients to denote any spiny plant.—B.
Campanulaceæ	..	genus Campanula, *q. v.*
Canellaceae	..	genus Canella.
Capparidaceæ	..	genus Capparis, *q. v.*
Caprifoliaceæ	..	genus Caprifolium: meaning a goat-leaf, possibly in reference to the climbing habit.—B.
Caryophyllaceæ	..	genus Caryophyllus: an old botanical name for the clove pink; the application of the name obscure.—B.
Casuarinaceæ	.	genus Casuarina, *q. v.*
Celastraceæ †	..	genus Celastrus: from the Greek name for the Privet.—N.
Ceratophyllaceæ †	..	genus Ceratophyllum, *q. v.*
Chailletiaceæ † *	..	genus Chailletia, *q. v.*
Chenopodiaceæ	..	genus Chenopodium, *q. v.*
Combretaceæ	..	genus Combretum, *q. v.*
Commelinaceæ	..	genus Commelina, *q. v.*
Compositæ	..	after the form of the inflorescence.
Coniferæ	..	after the form of the fruit.
Connaraceæ †	..	genus Connarus: an ancient name of a plant.—N.
Convolvulaceæ	..	genus Convolvulus, *q. v.*
Cornaceæ †	..	genus Cornus: *cornu*, a horn: the wood thought to be as hard as horn.—N.
Crassulaceæ	..	genus Crassula: diminutive of *Crassus* thick: the leaves are such.
Cruciferæ	..	after the form of the corolla.
Cucurbitaceæ	..	genus Cucurbita, *q. v.*
Cycadaceæ	..	genus Cycas, *q. v.*
Cyclanthaceæ	..	genus Cyclanthus, *kyklos anthos*: the flowers are spirally arranged.
Cyperaceæ	..	genus Cyperus, *q. v.*
Datiscaceæ †	..	genus Datisca: derivation unknown.—N.
Dilleniaceæ	..	genus Dillenia, *q. v.*
Dioscoreaceæ	..	genus Dioscorea, *q. v.*
Dipterocarpaceæ	..	genus Dipterocarpus, *q. v.*
Droseraceæ †	..	genus Drosera, *q. v.*
Ebenaceæ	..	from the Latin *ebenus*, meaning ebony.
Elæagnaceæ †	..	genus Elæagnus, *q. v.*
Elatinaceæ †	..	genus Elatina, *q. v.*
Ericaceæ	..	genus Erica: *Erica* of Pliny.

* * Borraginacecæ in E. & P.
* Called Dichapetalaceæ by Engler and Prantl

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Eriocaulaceæ †	..	genus Eriocaulon, *q. v.*
Euphorbiaceæ	..	genus Euphorbia, *q. v.*
Ficoideæ *	..	Fig-like.
Flagellariaceæ †	..	genus Flagellaria, *q. v.*
Fumariaceæ ‡	..	genus Fumaria, *q. v.*
Gentianaceæ	..	genus Gentiana, from GENTIUS, king of Illyria.—N.
Geraniaceæ	..	genus Geranium, *q. v.*
Gesneriaceæ	..	genus Gesneria, *q. v.*
Gnetaceæ†	..	genus Gnetum, *q. v.*
Goodeniaceæ	..	genus Goodenia: after Dr. Samuel GOODENOUGH, 1743-1827, Bishop of Carlisle, a botanist.—N.
Gramineæ	..	meaning grasses.
Guttiferæ	..	meaning drop-bearing, in allusion to the resinous exudation.—B.
Hæmodoraceæ †	..	genus Hæmodorum: *haima* blood, and *dorum*, a gift.—N.
Haloragidaceæ ¶†	..	genus Haloragis, *q. v.*
Hydrocharitaceæ	..	genus Hydrocharis, water-grace: a pretty water plant.
Hydrophyllaceæ	..	genus Hydrophyllum: leaves loaded with water in spring time.—N.
Hypericaceæ §†	..	genus Hypericum: the old Greek name used by Dioscorides.—N.
Ilicaceæ **†	..	genus Ilex, *q. v.*
Illecebraceæ‡‡†	..	genus Illecebrum: from *illecebra*, enticement applied by Pliny to *Sedum*.
Iridaceæ	..	genus Iris: meaning rainbow.
Juncaceæ †	..	genus Juncus, *q. v.*
Labiatæ	..	after the form of the corolla.
Lauraceæ	..	genus Laurus, *q. v.* (also written Laurineæ).
Leguminosæ	..	after the type of the fruit.
Lemnaceæ†	..	genus Lemna, *q. v.*
Lentibulariaceæ †	..	genus Lentibularia: said to mean lens and a small pipe; significance obscure.—B.
Liliaceæ	..	genus Lilium, its old Latin name.—N.
Linaceæ	..	genus Linum, *q. v.*
Loganiaceæ	..	genus Logania: after James LOGAN, 1674-1751, born in Ireland, Governor of Pennsylvania a writer on Botany.—N
Loranthaceæ	..	genus Loranthus, *q. v.*
Lythraceæ	..	genus Lythrum: *lythron*, black blood; alluding the colour of the flowers.—N.
Magnoliaceæ	..	genus Magnolia, *q. v.*
Malpighiaceæ	..	genus Malpighia, *q. v.*
Malvaceæ	..	genus Malva, *q. v.*
Melastomaceæ	..	genus Melastoma, *q. v.*
Meliaceæ	..	genus Melia, *q. v.*
Menispermaceæ	..	genus Menispermum: *mene*, the moon; *sperma*; a seed; in allusion to the half moon shaped seeds.—B.

* Called Aizoaceæ by Engler and Prantl.
‡ Merged with Papaveraceæ by E. and P.
¶ Engler and Prantl give it thus.—Halorrhagidaceæ.
§ Merged with Guttiferæ by E. and P.
** Aquifoliaceæ of E. and P.
‡‡ Under Caryophyllaceæ in E.and P.

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Moringaceæ	..	genus Moringa, *q. v.*
Myristicaceæ †	..	genus Myristica, *q. v.*
Myrsinaceæ	..	genus Myrsine, *q. v.*
Myrtaceæ	..	genus Myrtus, *q. v.*
Naiadaceæ †	..	genus Naias, *q. v.*
Nyctaginaceæ	..	genus Nyctago, meaning night in allusion to nocturnal flowering.—B.
Nymphæaceæ	..	genus Nymphæa, *q. v.*
Ochnaceæ	..	genus Ochna, *q. v.*
Olacaceæ †	..	genus Olax, *q. v.*
Oleaceæ	..	genus Olea, *q. v.*
Onagraceæ	..	genus Onagra, meaning a wild ass, after a fancied resemblance between the ears of that animal and the leaves of these plants.—B.
Orchidaceæ	..	genus Orchis, *q. v.*
Orobanchaceæ †	..	genus Orobanche, *q. v.*
Palmæ	..	from the Latin name *palma*.—B.
Pandanaceæ	..	genus Pandanus, *q. v.*
Papaveraceæ	..	genus Papaver, *q. v.*
Passifloraceæ	..	genus Passiflora, *q. v.*
Pedaliaceæ	..	genus Pedalium, *q. v.*
Phytolaccaceæ	..	genus Phytolacca: meaning plant and lac, in reference to the red juice of the fruit.—B.
Piperaceæ	..	genus Piper, *q. v.*
Pittosporaceæ †	..	genus Pittosporum, *q. v.*
Plantaginaceæ	..	genus Plantago, *q. v.*
Plumbaginaceæ	..	genus Plumbago, *q. v.*
Podostemonaceæ †	..	genus Podostemon, *q. v.*
Polemoniaceæ	..	genus Polemonium, an ancient name of doubtful application.—B.
Polygalaceæ †	..	genus Polygala, *q. v.*
Polygonaceæ	..	genus Polygonum, *q. v.*
Pontederiaceæ	..	genus Pontederia, *q. v.*
Portulacaceæ	..	genus Portulaca, *q. v.*
Primulaceæ	..	genus Primula : *primus*, first; referring to the early flowering.—N.
Proteaceæ	..	genus Protea : from the sea-god Proteus, in allusion to the great diversity of the genus.—B.
Ranunculaceæ	..	genus Ranunculus, *q. v.*
Resedaceæ	..	genus Reseda, *q. v.*
Rhamnaceæ	..	genus Rhamnus, *q. v.*
Rhizophoraceæ†	..	genus Rhizophora, *q. v.*
Rosaceæ	..	genus Rosa, *q. v.*
Rubiaceæ	..	genus Rubia, *q. v.*
Rutaceæ	..	genus Ruta, *q. v.*
Sabiaceæ†	..	genus Sabia.
Salicaceæ	..	genus Salix, *q. v.*
Salvadoraceæ†	..	genus Salvadora, *q. v.*
Samydaceæ*†	..	genus Samyda : *Samydo*, the birch : named after the resemblance in habit.—N.
Santalaceæ	..	genus Santalum, *q. v.*
Sapindaceæ	..	genus Sapindus, *q. v.*
Sapotaceæ	..	genus Sapota, *q. v.*
Saxifragaceæ	..	genus Saxifraga, *q. v.*
Scitamineæ	..	

* Flacourtiaceæ of Engler and Prantl.

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Scrophulariaceæ	..	genus Scrophularia: so named in reference to its supposed medicinal qualities in cases of Scrofula.—N.
Simarubaceæ	..	genus Simaruba: the name of a plant—the Caribbean.
Solanaceæ	..	genus Solanum, *q. v.*
Sterculiaceæ	..	genus Sterculia, *q. v.*
Styracaceæ†	..	genus Styrax: the ancient Greek name of the plant which produces Storax.—N.
Taccaceæ	..	genus Tacca, *q. v.*
Tamaricaceæ†	..	genus Tamarix, *q. v.*
Ternstrœmiaceæ†	..	genus Ternstrœmia after Christopher TERNSTRŒM a Swedish naturalist and traveller in China; died 1745.—N.
Thymelæaceæ‡ †	..	genus Thymelæa, meaning thyme and olive or oil.—B.
Tiliaceæ	..	genus Tilia: the old Latin name for the Lime.
Turneraceæ	..	genus Turnera, *q. v.*
Typhaceæ†	..	genus Typha, *q. v.*
Umbelliferæ	..	after the form of the inflorescence.
Urticaceæ	..	genus Urtica, *q. v.*
Valerianaceæ	..	genus Valeriana, a name of uncertain origin.—B.
Verbenaceæ	..	genus Verbena, *q. v.*
Violaceæ	..	genus Viola, *q. v.*
Vitaceæ	..	genus Vitis, *q. v.*
Xyridaceæ †	..	genus Xyris, *q. v.*
Zygophyllaceæ	..	genus Zygophyllum, *q. v.*

BOTANICAL AUTHORS.

The following are the authors of the genera of the Bombay Presidency.

Adans.	..	Michael Adanson, 1727-1806. France.
Ait.	..	William Aiton, 1731-1793. England.
Anders.	..	G. Anderson.
And., T.	..	Thomas Anderson, Director of Botanical Gardens in Calcutta.
Arn.	..	George Arnold Walker-Arnott, 1799-1868. Scotland.*
Aubl.	..	J. B. C. F. Aublet, 1720-1778. France.
Auct. or *Auth.*	..	Authors: referring by usage to various or many writers.
Baill. or *H. Bn.*	..	H. Baillon, author of the great Natural History of Plants in French.
Bartl.	..	F. G. Bartling.
Beauv. or *P. B.*	..	Ambroise Maria Francois Joseph Palisot de Beauvois 1755-1820. France.
Bec.	..	O. Beccari, Italian botanist.
Benn.	..	J. J. Bennett.
Benth.	..	George Bentham, 1800-1884, one of the distinguished botanist of England, one of the authors of Bentham and Hooker's "Genera Plantarum."
Berger.	..	Ernst Berger, died 1853. Germany.

‡ Cooke has Thymeleæceæ, a misprint.
Explanation of abbreviations :—B. = Bailey's Standard Cyclopedia of Horticulture. N. = Nicholson's Dictionary of Gardening.
* See this Journal, Vol. XVII, p. 567.

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Bernh	..	Johann Jacob Bernhardi, 1774-1850. Germany.
Berry.	..	
Bge.	..	A. Bunge.
Bigel.	..	Jacob Bigelow, 1787-1879. Massachusetts.
Blanco.	..	
Bl.	..	Karl Ludwig Blume, born 1796 at Braunschweig, died 1862 at Leyden.
Boiss.	..	Edmond Boissier, 1810-1886. Switzerland. Author of "Flora Orientalis" and other works.
Boj.	..	W. Bojer, 1800-1856, author of Flora of Mauritius. Austria.
Borkh.	..	Moritz Balthasar Borkhausen, 1760-1806. Germany.
Bory.	..	J. B. Bory de St. Vincent.
Br. or *Br., P.*	..	P. Brown.
Br., R.	..	Robert Brown, born 1773, Scotland, died 1858, London. Author of many important works.
Brongn.	..	Adolphe Théodore Brongniart, 1801-1876. France.
Buch-Ham.	..	Dr. Francis Hamilton, formerly Buchanan.
Bunge.	..	Alexander von Bunge, 1803-1890. Russia.
Bur.	..	E. Bureau.
Burm.	..	Johannes Burmann, 1706-1779, Professor at Amasterdam: wrote on plants of Ceylon and Malabar.
Burm. f.	..	Nickolous Laurens Burmann, 1734-1793, son of the preceding.
Camb.	..	Cambess.
Cass.	..	Alexander Henri Gabriel Cassini, Comte de, 1781-1832. France.
Cav.	..	Antonio Jose Cavanilles, 1745-1804. Spain.
C. B. C.	..	C. B. Clarke, the well known Indian botanist.
Cerv.	..	Vincente Cervantes, 1759 (?)-1829. Spanish botanist.
Cham.	..	Adalbert von Chamisso, poet and naturalist, 1781-1838. Germany.
Chois.	..	Jacque Denys Choisy, 1799-1859. Switzerland.
Coem.	..	E. Coemans.
Colebr.	..	Henry Thomas Colebrooke, 1765-1837. England.
Comm.	..	P. Commerson.
Corr.	..	J. F. Correa-de-Serra.
Cunn.	..	A. Cunningham.
Cyr.	..	D. Cryrillo.
Dalz.	..	Nicholas A. Dalzell; the joint author of Dalzell and Gibson's Bombay Flora—1861.
DC.	..	Augustin Pyramus De Candolle, 1778-1841, projector of the Prodromus, and head of a distinguished family.
DC., A.	..	Alphonse De Candolle, the son (1806-1893).
DC., C.	..	Casimir De Candolle, the grandson.
Dcne.	..	Joseph Decaisne, 1809-1882. France.
Del.	..	A. Raffeneau Delile.
Dennst.	..	A. W. Dennstedt.
Desf.	..	René Louiche Desfontaines, 1750-1833. France.
Desv.	..	Augustin Nicaise Desvaux, 1784-1856. France.
Dill.	..	Johann Jacob Dillenius, Professor of Botany in Oxford, 1687-1747.
Don.	..	George Don, 1798-1856. England.
Don., D.	..	David Don, brother of George, 1800-1841. Scotland.
Dr.	..	Prof. O. Drude of Dresden, Germany.
Dry.	..	Jonas Dryander, 1748-1810. Sweden.

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Dmrt.	..	Barthèlemy Charles Dumortier, 1797-1878. Belgium.
Dunal.	..	Michel Felix Dunal, 1789-1856. France.
Durazz.	..	
Duval.	..	
Ellis.	..	John Ellis, 1711-1776. England.
Endl.	..	Stephan Ladislaus Endlicher, 1804-1849, Professor at Vienna. Numerous works.
Esch.	..	Johann Friedrick Eschscholtz, 1793-1831. Germany.
Fenzl.	..	Edward Fenzl, Professor and Custodian of botanical museum at Wiens, 1808-1879.
Fisch.	..	Friedrich Ernst Ludwig von Fischer, 1782-1854. Russia.
Forsk.	..	Pehr. Forskal, 1736-1768; collected in Egypt and Arabia.
Forst.	..	G. Forster, son of Johann Reinhold Forster. Germany.
Foug.	..	A. D. Fougeroux.
Fresen.	..	G. Fresenius.
Gamble.	..	J. S. Gamble of the Indian Forest Department.
Gasp.	..	
Gardn.	..	Gardner.
Gartn.	..	Joseph Gartner, 1732-1791. Germany.
Gartn. f.	..	C. F. Gartner, son of the preceding.
Gaud.	..	Charles Gaudichaud-Beaupre, 1789-1864. France.
Gawl.	..	See Ker-Gawl below.
Gib.	..	Alexander Gibson.
Gmel.	..	Samuel Gottlieb Gmelin, 1743-1774. Russia.
Godr.	..	D. A. Godren.
Grah.	..	R. *or* J. Graham.*
Gray.	..	Asa Gray, 1810-1888, Harvard University, Massachusetts. America's most noted botanist.
Gren.	..	C. Grenier.
Griff.	..	William Griffith, 1810-1845. England. †
Griseb.	..	Heinrich Rudolph August Grisebach, 1814-1879. Germany.
Gronov.	..	Gronovius.
Hack.	..	J. C. Hackel.
Hall.	..	A. Haller.
Ham.	..	F. Hamilton.
Hance.	..	
Hassk.	..	Justus Karl. Hasskarl, born 1811. Germany.
Haust.	..	J. Haustein.
Hartm.	..	C. J. Hartmann.
Harv.	..	W. H. Harvey.
Haw.	..	Adrian Hardy Haworth, 1772-1833. England.
H. B. K.	..	Friedrich Alexander von Humboldt, 1796-1859. Germany. Aimé Bonpland, 1773-1858. France. Karl Sigismund Kunth, 1788-1850. Germany. Authors of a great work on plants of the New World.
Herb.	..	William Herbert, 1778-1847. England.
Hochst.	..	Christian Friedrich Hochstetter, 1787-1860; described many African plants.
Hoffm.	..	George Franz Hoffmann, 1761-1826. Germany.
Hook.	..	William Jackson Hooker, 1785-1865. England.
H. f.	..	Joseph Dalton Hooker, the son, 1817-1911. England.
Horkel.	..	
Houst.	..	W. Houston.
Jack.	..	B. Daydon Jackson.

* *Ibid*, p. 567.

† *Ibid*, pp. 565-6.

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Jacq. ..	J. F. de Jacquin, and *Jacq. f.*, his son.
Jaub. ..	Hippolyte François de Jaubert. French botanist. Born 1798.
Juss. ..	Antoine Laurent Jussieu, 1748-1836, the first to introduce the natural families of plants. France.
Juss. A. ..	Ad. de Jussieu.
Ker or *Ker-Gawl.* ..	John Bellenden Ker, 1765 (?)-1871, botanist, wit and man of fashion. First known as John Gawler. In 1793 was compelled to leave army because of sympathy with French Revolution. His name was changed in 1804 to John Ker Bellenden, but he was known to his friends as Bellenden Ker. First editor of Edward's Botanical Register.
Klatt. ..	Freidrich Wilhelm Klatt, a German botanist.
Koehne. ..	Emil Koehne, Professor at Berlin. Pub. "Deutsche Dendrologie."
Kön. ..	C. *or* J. G. Köning.
Korth ..	P. W. Korthals.
Kotschy. ..	Theodor Kotschy, assistant curator at Vienna, 1813-1866. Wrote on oriental plants.
Kth. ..	See H. B. K.
Kurz. ..	
Labill. ..	J. J. de Labillardiere.
Lam. or *Lamk.* ..	Jean Baptiste Antoine Pierre Monnet Lamarck, 1744-1829, author of the Lamarckian philosophy of organic evolution. France.
Laur. ..	Antoine Laurent.
Lehm. ..	Johann Georg Christian Lehmann, 1792-1860, Professor at Hamburg, wrote several monographs, and described many new plants.
Lesch. ..	L. T. Leschenault.*
Less. ..	C. F. Lessing.
L'Her. ..	C. L. L'Heritier de Brutelle, 1746-1800. France.
Lind. ..	J. Linden, 1817-1898. Belgium. For many years Director of L'Illustration Horticole.
Link. ..	Heinrich Friedrich Link, 1767-1851. Germany.
Linn. or *L.* ..	Carolus Linnæus (Carl von Linné), 1707-1778, the "Father of Botany" and author of binomial nomenclature. Sweden.
L. f. ..	Carl von Linné, the son, 1741-1783. Sweden.
Löfl. ..	P. Löffling.
Lour. ..	Juan Loureiro, 1715-1796, Missionary in China. Portugal.
Manso. ..	
Mart. ..	Karl Friedrich Philipp von Martius, 1794-1868, Professor at Munich, monographer of Palms, founder of the great Flora Brasiliensis, and author of many works.
Maton. ..	
Medik. ..	Friedrich Casmir Medikus, 1736-1808, Director of the garden at Mannheim.
Meisn. ..	Karl Friedrich Meisner, 1800-1874. Switzerland.
Mey. E. ..	Enrst Heinrich Friedrich Meyer, 1791-1851, Prussia.
Mey. C. A. ..	Carl Anton Meyer, 1795-1855, director of the botanic garden at St. Petersburg, wrote on Russian botany.
Micheli. M. ..	

* See *ibid*, p. 564.

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Mich.	..	André Michaux, 1746-1802. France, but for ten years a resident of North America.
Miers.	..	
Mik.	..	Mikan.
Mill.	..	Phillip Miller, 1691-1771, of Chelsea, England, author of a celebrated Dictionary of Gardening, which had many editions.
Mœnch.	..	Konrad Mœnch, 1744-1805. Germany.
Moq.	..	Alfred Moquin-Tandon, 1804-1863. France.
Mor.	..	A. Moritzi.
Moric.	..	
Muhl.	..	Henry Ludwig Muhlenberg, 1756-1817, Pennsylvania.
Mull. Arg.	..	Jean Muller, of Aargau, 1828-1896, wrote for De Candolle's "Prodromus", Vol. 16.
Mull. F.	..	Ferdinand von Muller, royal botanist at Melbourne, has written much on Australian and economic botany. 1825-1896.
Munro.	..	
Mut.	..	J. C. Mutis.
Naud.	..	Charles Naudin, 1815-1899, botanist, frequent contributor to "Revue Horticole."
Neck.	..	N. J. de Necker.
Nees.	..	Christian Gottfried Nees von Esenbeck, 1776-1858. Prussia.
Nimmo.	..	
Nor.	..	Fernando de Noronha, died 1787 in Isle de France.
Nutt.	..	Thomas Nuttall, 1786-1859. Massachusetts.
Ort.	..	Casimiro Gomez Ortega, 1740-1818. Spain.
Otto.	..	Friedrich Otto, 1782-1856. Germany.
Pauq.	..	C. L. C. Pauquy.
P. B.	..	See *Beauv* above.
Pers.	..	Christian Hendrick Persoon, 1755-1837. Germany.
Peyr.	..	J. Peyritsch.
Planch.	..	Jules Emile Planchon, Professor at Montpellier, France. 1833-1900.
Plum.	..	C. Plumier.
Pohl.	..	Johann Emmanuel Pohl, 1782-1834 Professor at Vienna, wrote a large book on travels in Brazil.
Poir.	..	Jean Louis Marie Poiret, 1755-1834. France.
Popp.	..	E. Popping.
Presl.	..	Karl Boriweg Presl, 1794-1852. Bohemia.
Raddi.	..	Guiseppe Raddi, 1770-1829. Italy.
Rafin.	..	Constantino Samuel Rafinesque-Schmaltz, 1784-1842. Professor of Natural History, Transyvania University. Lexington, Kentucky.
Rgl.	..	Eduard von Regel, 1815-1892, German, founder of Gartenflora. Director, botanic garden at St. Petersburg.
Rchb.	..	Heinrich Gottlieb Ludwig Reichenbach, 1793-1879. Germany.
Rchb. f.	..	Heinrich Gustav Reichenbach, 1823-1889, son of the preceding. Orchids.
Retz.	..	
Rich.	..	A. Richard.
Rich., L. C.	..	Louis Claude Marie Richard, 1754-1821, France.
Roth.	..	Albrecht Wilhelm Roth, 1757-1834. Physician at Vegesack, near Bremen.

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Rottb.	..	C. F. Rottboll.
Roxb.	..	William Roxburgh, 1759-1815. India.*
Royen.	..	
Royle.	..	John Forbes Royle, born 1800 at Cawnpore, died 1858, London. Professor in London. Plants of India.†
Rupp.	..	
Salisb.	..	Richard Antony Salisbury, 1761-1829. England.
Salm-Dyck.	..	Joseph, Prince and High Count Salm-Reifferscheidt-Dyck, born at Dyck, 1773, died 1861. Wrote on Alœ, Cactus, Mesembryanthemum.
Savi.	..	Gætano Savi, died 1844. Italy.
Schau.	..	J. K. Schauer.
Sch. Bip.	..	C. H. Schultz (Bipontinus).
Schlcht.	..	Diedrich Franz Leonhard von Schlechtendahl, 1794-1866. Professor at Halle, wrote several memoirs in Latin and German.
Schleid.	..	M. J. Schleiden.
Schnitzl.	..	A. Schnitzlein.
Schott.	..	Heinrich Wilhelm Schott, 1794-1865. Wrote much on Aroids with Nyman and Kotschy.
Schrad	..	Heinrich Adolph Schrader, 1767-1836. Germany.
Schrank.	.	
Schreb.	..	J. C. D. Schreber.
Scop.	..	Johann Anton Scopoli, 1723-1788. Italy.
Seem.	..	Berthold Seemann, Hanover, 1825-1872. Wrote on Palms and botany of the voyage of the *Herald*.
Sendtn.	..	G. Sendtner.
Sieb. & Zucc.	..	Philipp Franz von Siebold, 1796-1866, and Joseph Gerhard Zuccarini, 1797-1848. Germany.
Silv. Manso.	..	
Sm.	..	Sir James Edward Smith, 1759-1828. England.
Sonn.	..	P. Sonnerat.
Spach.	..	Eduard Spach, born 1801 Strassburg, died 1879.
Spreng.	..	Kurt Sprengel, 1766-1833. Germany.
Stadm.	..	
Stapf.	..	Otto Stapf.
Steinh.	..	A. Steinheil.
St. Hil.	..	Auguste de Saint Hilaire, 1779-1853. France.
Stocks.	..	
Sw.	..	Olof Swartz, 1760-1818. Sweden.
Thoms., T.	..	T. Thomson.
Thou.	..	Du Petit Thouars.
Thunb.	..	Carl Peter Thunberg, 1743-1822, wrote "Flora Japonica" (1784). Sweden.
Thw.	..	George Henry Kendrick Thwaites, 1811-1882, Ceylon botanist.
Tourn.	..	J. P. de Tournefort, 1656-1708. France.
Trèc.	..	Trecul.
Trin.	..	C. B. Trinius.
Tul.	..	
Vahl.	..	Martin Vahl, 1749-1804. Denmark.
Vaill.	..	
Vent.	..	Etienne Pierre Ventenat, 1757-1808. France.
Vis.	..	R. de Visiani.
Vog.	..	H. Vogel.

* See *ibid*, p. 564. † *Ibid*, p. 566.

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Wall.	..	Nathanael Wallich, born 1786, Copenhagen, died 1854, London. Wrote on plants of India and Asia.
Wats.	..	Sereno Watson, 1826-1892, Harvard University.
Web.	..	Friedrich Weber, 1781-1823. Germany.
Wedd.	..	H. A. Weddell, wrote for De Candolle's "Prodromus", Vol. 16, etc.
Welw.	..	Friedrich Welwitsch, 1806-1872.
Wendl.	..	Hermann Wendland, Director of Royal botanic garden at Herrenhaasen, one of the chief writers on Palms.
Wendl. & Dr.	..	Wendland and Drude.
Wight.	..	Robert Wight, writer on Indian plants, 1796-1872.*
Willd.	..	Karl Ludwig Willdenow, 1765-1812. Germany.
Wurmb.	..	
Zoll.	..	H. Zollinger.
Zucc.	..	Joseph Gerhard Zuccarini, 1797-1848, Professor at Munich.
E. & Z.	..	C. F. Ecklon and Zeyher.
F. & M.	..	Fischer and Meyer.
G. & G.	..	Gren. and Godr. (see above).
H. & B.	..	F. H. A. de Humboldt and Aime Bonapland, 1773-1858. France.
H. & L.	..	Hoffmg. and Link.
R. & P.	..	Ruiz. and Pav.—Hipolito Ruiz Lopez, 1764-1815, and Jose Pavon, authors of a Flora of Peru and Chile. Spain.
R. & S.	..	Roemer and Schultes.
S. & Z.	..	See under Sieb. and Zucc.
W. & A.	..	R. Wight and G. A. W. Arnott.
H. B. & K.	..	See H. B. K. above.

N.B.—The abbreviations are mainly those adopted by Cooke in his Bombay Flora. The particulars given above are chiefly obtained out of Bailey's Standard Cyclopedia of Horticulture.

THE GENERA OF BOMBAY PLANTS WITH DERIVATIONS OF THE NAMES.

The Bombay Presidency includes Sind but not Aden for the purposes of this list. The genera in CAPITAL letters are indigenous. Exotic genera that are naturalised are treated as indigenous. Those in ordinary roman type are introduced or foreign. The synonyms are in *italics*. Only such synonyms are given as are mentioned by Cooke. A † after an indigenous genus indicates that its species are also cultivated in Bombay. Those marked indigenous genera and the introduced genera form together a complete list of the cultivated genera of Bombay. Plants growing in private gardens of which no published records are available have not been mentioned. Also specimens grown in botanical gardens for a mere botanical interest are not included. Otherwise the list that is given here not only gives derivations but also serves as a complete record of indigenous and cultivated genera of Bombay in a very concise form. I do not know of the publication of any complete list before.†

As regards the derivations, they are largely taken from Nicholson's 'Dictionary of Gardening.' Other sources are Collett's 'Flora Simlensis,' Drury's 'Hand Book of the Indian Flora,' and Bailey's 'Standard Cyclopedia of Horticulture.' These authorities are acknowledged in the body of

* See this Journal, Vol. XVII, p. 567.

† Cooke in his "Bombay Flora" gives all the indigenous genera with full descriptions. He merely mentions the introduced genera with the species and he omits about half their number.

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the list by affixing the letters N., C., D. and B. respectively to the derivations. Mr. G. A. Gammie also supplied some of the derivations, and my best thanks are due to him. I am also greatly indebted to Mr. G. F. Zimmer, F.R.H.S., F.Z.S., A.M. Inst. C.E., author of "A Popular Dictionary of Botanical Names and Terms, London," for supplying the derivations in a large number of cases, which but for his assistance would have been left out. I have acknowledged this fact in the body of the list by placing the letter Z. after the derivations supplied by him. There yet remain a few names against which nothing could be entered. In the case of descriptive names of indigenous genera I have determined the applicability of the name so far as the Bombay species are concerned, and made a note of it. I should lastly mention that I have collated the names as given by Cooke with Engler and Prantl's 'Pflanzenfamilien,' and with Durand's 'Index Generum Phanerogamorum', and pointed out the differences in foot-notes.

The list is given in a tabular form. The genus and its author are first mentioned. The latter name is abbreviated, and the abbreviation is explained above. Next follows the name of the natural order to which the genus belongs. It is also abbreviated. Elsewhere the names of the orders are given in full in the alphabetical order. Next the date of publication of the generic name is given. After the date the derivation and its application are given. The letters N., C., D., B. and Z. follow them as explained above. Lastly, I have given, at the suggestion of Mr. N. B. Kinnear, the popular English name and occasionally the local name of a plant belonging to the genus wherever I could do so for the benefit of the readers.

A word may be said here regarding the shortcomings of the compilation. My special difficulty was in connection with the orthography of the generic names. The original papers in which the names were published by their authors for the first time are not accessible to me. Even in standard works like Durand's "Index" or Engler and Prantl's "Pflanzenfamilian" I occasionally found one spelling in the text and another in the index (*e.g.*, Millettia and Milletia in the former work, and Pajanella and Pajanelia in the latter work). I have followed Index Kewensis, from which the dates of publication are also taken. The rule in the matter of nomenclature is that the original spelling given by the author of the name should be observed regardless of there being left any error or inaccuracy in it, for the process of correction would lead to endless confusion. With regard to the derivations, I have followed my authorities without any research on my own part. If any scholars among the readers make a critical study, I shall feel obliged if they would communicate the results to me or to the Editors of this Journal. The authorities that I have followed are by no means infallible. The rule with botanists on the subject of derivations may be stated here that whenever the author of a name gives its derivation, that derivation is accepted as final. Thus Chrysalidocarpus is derived by its author Wendland from *chrysalis* and *carpus*, as the fruit deprived of its epicarp resembles a chrysalis. Bailey is therefore wrong when he gives the derivative meaning to be "golden fruit" in "The Standard Cyclopedia of Horticulture" edited by him. It may be added that some nomenclators give the derivation of the name of a new genus or a new species, while others do not give any explanation for the name adopted. The names are mostly derived from Greek. When they are otherwise derived, the particular origin is mentioned in most cases.

Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Abelmoschus, Medik. . .	Malva.	1787 . .	Arabic *Kalb-el-misk*, a grain of musk.
Aberia, Hochst. . .	Bixa.	1844 . .	from Mount Aber in Abyssinia.—B.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Abildgaardia, Vahl.	Cyper.	1806	after Professor Abildgaard of Copenhagen.
Abroma, Jacq.	Stercul.	1776	from *a*, not, and *broma*, food; unfit for eating. Cf. *Theobroma* below. —N. *Devil's-cotton.*
Abronia, Juss.	Nyct.	1789	from *abros*, delicate; the involucre is referred to—N.
Abrus, L.†	Leg. P.	1737	from *abros*, soft; in reference to the extreme softness of the leaves. —N.
Abutilon, Tourn†	Malva.	1763	The Greek name for Mulberry (Drury); an Arabic plant name. —N.
Acacia, (Tourn.) L. †*.	Leg. M.	1737	from celtic *ac*, a point; the spines are referred to.—N. *Babul.*
Acalypha, L.†	Euphor.	1737	from *a*, *calos*, and *aphe*, not pleasant to the touch.—N. *Copper-leaf.*
Acampe, Lindl.	Orchid.	1853	from *akampes*, inflexible; in allusion to the brittle texture of the flower.
Acanthodium, Del.	Acanth.	1812	from *acantha*, a spine, and *eidos*, like.
Acanthorhiza, Wendl.	Palm.	1878	the aerial roots are spiny.—N.
Acanthus, (Tourn.) L.	Acanth.	1735	from *acantha*, a spine; the bracts are referred to.—N.
Achillea, L.	Compo.	1735	after Achilles, who is said to have discovered their properties.—N.
Achimenes, P. Br.	Gesner.	1756	from *cheimaino*, to suffer from cold; alluding to the general tenderness of the plants.—N.
Achras, L.	Sapot.	1737	from *akras*, a kind of wild pear.—N. *Chiku* or *Sapodilla-plum.*
Achyranthes, L.	Amarant.	1737	from *achyron*; chaff; the perianth is chaff-like.—D.
Acorus, L.	Araceæ.	1737	from *a*, without; and *kore*, the pupil of the eye; a medicinal name.—N. *Sweet-flag.*
Acrocephalus, Benth.	Lab.	1829	from *akron*, summit, and *kephale*, the head; the flowers are terminal.—D.
Acroclinium, A. Gray.	Compo.	1852	from *akros* and *cline* (a bed); the heads are solitary and terminal.—N.
Acrocomia, Mart.	Palm.	1823	from *akros* and *kome*; the leaves form a tuft at the top.—N.
Acronychia, Forst.	Ruta.	1776	from *akron* and *onux* (a claw); referring to the curved points of the petals.—N.
Actephila, Bl.	Euphor.	1825	from *acte*, height, and *philos*, partial to.
Actinodaphne, Nees.	Laurin.	1831	from *aktin*, a ray, and *daphne*, a laurel.

* Willd. in Cooke.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Actinorhytis, Wendl. & Dr.	.. Palm.	1875	.. from *aktin*, a ray, and *rhytis*, a wrinkle.
Adansonia,* L.	.. Malva.	**1753	.. after Michael Adanson, a French botanist.—N. *Baobab-tree.*
Adelia, L.	.. Euphor.	1759	.. from *a*, not, and *delos*, visible; referring to the parts of fructification.—B.
Adenanthera, (Royen) L. †	Leg. M.	1737	.. the anthers are gland crested; however, a number of other allied genera have the same character. —N. *Ratan-gung.*
Adenema, G. Don.	.. Gentia.	1837	.. *aden*, a gland, *emano*, to flow out.
Adenium, R. & S.	.. Apocyn.	1819	.. from Aden in Arabia; a geographical name.
Adenochlæna, Boiss.	.. Euphor.	1858	.. from *aden*, a gland, and *chlæna*, a cloak; allusion?
Adenoon, Dalz.	.. Compo.	1850	.. *aden*, a gland, *oon*, an ovule; the achenes are glandular between the ribs.
Adenophora, Fisch.	.. Camp.	1823	.. from *aden* and *phoreo*; the gland is at the base of the style.—N.
Adenosma, Nees.	.. Acanth.	1832	.. from *aden*, a gland, and *osme*, smell; the leaves bear odoriferous glands.
Adenostemma, Forst	. Compo.	1776	.. from *aden* and *stemma* (a crown); the achenes have glandular apices.
Adhatoda, Tourn.‡†	.. Acanth.	1790	.. from its native name in Malabar.—N. *Adusa.*
Adina, Salisb.	.. Rubia.	1807	.. from *adinos*, crowded; the flowers being disposed in heads.
Adonis, (Dill.) L.	.. Ranun.	1735	.. a classical name.—N.
Æchmandra, Arn.	.. Cucur.	1841	.. from *aichme* and *andros*; the *male* flowers are crowded at the *apex* of a long peduncle.
Æchmea, R. & P.	.. Bromel.	1794	.. *aichme*, a point; the calyx is referred to.
Ægiceras, Gärtn.†	.. Myrsi.	1788	.. from *aigos*, a goat, and *keras*, horn; in allusion to the curved fruit.—N.
Æginetia, L.	.. Orob.	1735	.. in honour of P. Æginette, a physician.
Ægle, Corr.†	.. Ruta.	1800	.. one of the Hesperides, the maidens who guarded the golden apple which Earth gave to Hera on her marriage to Zeus.—*Golden-apple* or *Bael-tree.*
Æluropus, Trin.	.. Gram.	1820	.. *ailouros*, a cat, *pous*, a foot.
Ærides, Lour.†	.. Orchid.	1790	.. from *aer*, air; a habitat name.—N. *Air-plant.*

* Naturalised in the Bombay Presidency.
** Bombacaceæ in E. & P.
‡ Nees (1832) in Cooke.

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GENUS AND AUTHOR.	NATURAL ORDER.	DATE.	DERIVATION AND COMMON NAME.
ÆRUA, Forsk.	.. Amarant.	1789	.. from its Arabic name *Eroua*.
ÆSCHYNANTHUS, Jack.	Gesner.	1823	.. from *aischimo*, to be ashamed, and *anthos*, a flower.—N. *Blushwort*.
ÆSCHYNOMENE, L.	.. Leg. P.	1737	.. from *aischimo*, to be ashamed, and *nomen*, a name; in reference to the leaves being sensative.—N. *Sola-plant*.
Ætheilema, R. Br.	.. Acanth.	1810	.. from *aeithos*, shining, and *eilema*, a wrapper; the bracts are referred to, which become large and white when mature.
AGANOSMA, G. Don.†	.. Apocyn.	1837	.. from *aganos*, mild, and *osme*, smell.
Agapanthus, L'Her.	.. Lil.	1788	.. from *agape*, love, and *anthos*, flower. —N. *African Lily* or *Love-flower*.
Agati, Desv.	.. Leg. P.	1763	.. from Sanskrit.—N.
Agave, L.	.. Amaryll.	1748	.. from *agauos*, illustrious.—N. *Aloe* or *Century-plant*.
AGERATUM, L.†	.. Compo.	1737	.. from *a*, not, and *geras*, age; alluding to the flowers' colours.
Aggeranthus,* Wight...	Orchid.	1852	.. from *aggeron* and *anthos*; meaning vase-shaped flowers.
AGLAIA, Lour.	.. Melia.	1790	.. AGLAIA is the youngest of the three Graces; *aglaos* means brilliant.
Aglaonema, Schott	.. Araceæ.	1829	.. from *aglaos*, bright, and *nema*, thread; the filaments are referred to—N.
Agrostemma, L.	.. Caryo.	1737	.. from *agros*, a field, and *stemma*, a crown: formerly the flowers were made into crowns or garlands.—N. *Corn Cockle*.
Agrostis, L.	.. Gram.	1735	.. from *agros*, a field. *Bent-grass*.
AGROSTISTACHYS, Dalz.	Euphor.	1850	.. bearing grass like spikes; the bracts of the male flowers are arranged to form little grass like spikelets.
AILANTHUS, Desf.†	.. Simarub.	1789	.. from *ailanto*, lofty; referring to its lofty growth.—N. *Tree-of-heaven*.
AIZOON, L.	.. Ficoid.	1737	.. from *aei*, always, and *zoos*, living.—N.
ALANGIUM, Lam.	.. Corna.	1783	.. from its native name in Malabar. —N.
ALBIZZIA, Durazz.†	.. Leg. M.	1772	.. after ALBIZZI, an Italian naturalist of the eighteenth century.—C.
Aleurites, Forst.	.. Euphor.	1776	.. from a Greek word signifying floury.—N. *Candlenut-tree* or *Indian Walnut-tree*.
ALHAGI, Tourn.	.. Leg. P.	1763	.. an Arabian name.—N. *Camel's-thorn*.
Allamanda, L.	.. Apocyn.	1771	.. after Dr. ALLAMAND of Leyden, a contemporary of Linneus.—N.
Allium, (Tourn.) L.	.. Lil.	1735	.. from *all*, hot; in allusion to the burning taste.—N.
ALLMANIA, R. Br.	.. Amarant.	1832	.. after William ALLMAN, Professor of Botany, Dublin (?).

* *Aggeianthus* in Cooke, a misprint.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Allophylus, L.	Sapind.	1747	so named in reference to the variable leaves.—*N.*
Alloplectus, Mart.	Gesner.	1829	from *allo* and *pleco*; in allusion to the diversely plaited calyx.—N.
Alocasia, Neck.	Araceæ.	1790	from *a* and *Colocasia*.—N.
Aloe, (Tourn.) L.	Lil.	1735	from its Arabic name *alloeh*.—D. Greek *Aloe*.—N.
Aloysia, Ort. & Palav.	Verben.	1784	in honour of Maria Louisa, mother of Ferdinand VII, King of Spain.—N.
Alpinia, L. †	Scit.	1737	in honour of Prosper Alpinus, an Italian botanist.—N.
Alseodaphne, Nees.	Laurin.	1831	from *alsos*, a grove, and *daphne*, laural.—N.
Alstonia, R. Br. †	Apocyn.	1809	after Dr. Alston, Professor of Botany at Edinburgh.—N. *Devil-tree.*
Alternanthera, Forsk.	Amarant.	1775	meaning the anthers alternating (with the staminodes). It is not so in all the species; besides, this character is found in other genera of the same order as well.
Althæa, (Tourn.) L. †.	Malva.	1735	from *altheo*, to cure; a medicinal term.—N. *Hollyhock.*
Alyssum, (Tourn.) L.	Cruci.	1735	from *a*, not, and *lyssa*, rage; in reference to a fable that the plant allayed anger.—N. *Madwort.*
Alysicarpus, Neck.	Leg. P.	1790	*alusis*, a chain, *carpos*, fruit; the pod is jointed.—N.
Amarantus, L. †	Amarant.	1735	from *a*, not, and *maraino*, to wither; a character of the brilliant scarious bracts.—N. *Love-lies-bleeding* or *Amaranth.*
Amberboa, Less.	Compo.	1832	from the French *amberboi*, signifying a strongly smelling flower.—Z.
Amblogyna, Raf.**	Amarant.	1836	from *ambloma*, abortion, and *gyne*, a female; a medicinal term.—N.
Ameletia, DC.	Lythr.	1826	from *amelos*, neglected.—Z.
Amherstia, Wall.	Leg. C.	1830	after Countess Amherst, a promoter of botany.—N.
Ammannia, (Houst.) L.	Lythr.	1737	after Johann Ammann, a Swiss botanist of the eighteenth century.—C.
Ammobium, R. Br.	Compo.	1824	from *ammos*, sand, and *bios*, to live; a habitat name.—N.
Amomum, L.	Scit.	1736	from *a*, not, and *moms*, free from impurity; in allusion to the uncertain medicinal properties.—N.
Amoora, Roxb.†	Melia.	1819	*Amoor* is the Bengali name.—N.
Amorphophallus, Bl.†	Araceæ	1835	from *amorphos*, deformed, and *phallos*, mace.—N. *Yam or Suran.*

** *Amblogyne* in Durand and in E. & P.

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GENUS AND AUTHOR.	NATURAL ORDER.	DATE.	DERIVATION AND COMMON NAME.
Ampelocissus, Planch....	Ampel.	1884 ..	from *ampelos*, a vine, and *Kissos*, Ivy.
Amphilophium, Kth. ..	Bignon.	1818 ..	in allusion to the corolla being *crested on all sides*.—N.
ANACARDIUM,* L.**†	Anacard.	1735 ..	probably from *ana*, alike, and *cardia*, the heart, after the shape of the fruit.—N. *cf. Gynocardia* below. *Cashewnut*.
ANAGALLIS, (Tourn.) L.	Primul.	1735 ..	from *anagalao*, to laugh; supposed to produce such physiological action.—Delighting.—B.
ANAMIRTA, Colebr. ..	Meni.	1822 ..	meaning unknown.—N.
Ananas, L. ..	Bromel.	1735 ..	from *nanas*, its South American name.—N.
Ananassa, Lind. ..	Bromel.	1827 ..	do. do.
Anaphalis††, DC. ..	Compo.	1837 ..	the name of a plant classed by the Greeks next to the *Gnaphalium*.
Anarrhinum, Desf. ..	Scroph.	1800 ..	from *a* and *rhin*; the corolla is without a spur or has a very short one.—N.
ANCISTROCLADUS, Wall.	Ancistro.	1832 ..	from *ankistron*, a hook, and *cladus*, a branch; there are branch hooks.
ANDRACHNE, L. ..	Euphor.	1735 ..	a Greek name given to several plants, but chiefly to *Portulaca oleracea*.
ANDROGRAPHIS, Wall..	Acanth.	1832 ..	perhaps alludes to the bearded condition of the anthers.
ANDROPOGON, L.† ..	Gram.	1753 ..	from *andros* and *pogon*; the ear looks like a *man's beard*.—N.
ANEILEMA, R. Br. ..	Commel.	1810 ..	from *a*, not, and *eilema*, without a cover; in allusion to the non-spathecious bracts.—N.
Anemone, L. ..	Ranun.	1735 ..	from *anemos*, wind.
Anemopægma, Mart...	Bignon.	1845 ..	from *anemos* and *paigma*, the sport of the wind; in allusion to the climbing habit.
Anethum, (Tourn.) L...	Umbel.	1737 ..	from *ano*, upwards, and *theo*, to run—quick-growing.—N.
Angelonia, H. B. K...	Scroph.	1809 ..	its local name in South America.—N.
Angræcum, Bory.§ ..	Orchid.	1804 ..	a Malayan name.—N.
Anguillaria, R. Br. ..	Lil.	1810 ..	in honour of Luigi ANGUILLARA, professor of botany at Padua; died 1570.—N.
Anictoclea, Nimmo. ..	Datis.	1839 ..	from *aneiktos*, open, and *kleis*, a lock.—Z.
ANISEIA, Choisy. ..	Convol.	1833 ..	from *anisos*, unequal; the sepals are referred to.
ANISOCHILUS, Wall. ..	Labiat.	1831 ..	from *anisos* and *cheilos*, in reference to the unequal lips of the calyx.

* Originally a native of Tropical America, naturalised in India.
** Rottb. (1775) in Cooke.
†† *Anaphalis* is excluded by Cooke.
§ Angræcum, Thou. in Durand.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Anisomeles, R. Br. †	Labiat.	1810	from *anisos* and *melos* (a member); in reference to the anthers of the longer stamens being halved.—N.
Anisonema, A. Juss.	Euphor.	1824	from *anisos*, unequal, and *nema*, a thread; the unequal stamens are referred to.
Anodendron, A. DC.	Apocyn.	1844	from *ano*, above, and *dendron*, a tree; in allusion to the climbers occupying the top of other trees.
Anœctchilus, Bl.	Orchid.	1825	from *anoikios*, open, and *cheilos*, a lip.—N.
Anogeissus, Wall.	Combret.	1832	from *ano*, the upper half, and *geisson*, a covering roof.—Z.
Anomospermum, Dalz.	Euphor.	1851	from *anomos*, lawless, and *sperma*, seeds.—N.
Anona, L.†	Anona.	1735	its native name in St. Domingo.—N.
Anotis, DC.	Rubia.	1830	from *aneu*, without, and *ous*, *otos*, an ear; referring to the absence of intermediate teeth between the calyx-lobes.—C.
Anthemis, (Mich.) L.	Compo.	1735	from *anthemon*, a flower; bearing a profusion of flowers.—N.
Anthericum, L.	Lil.	1735	from *anthos*, a flower, and *kerkos*, a hedge, a hedge of flowers.—N.
Anthistiria, L. f.	Gram.	1779	supposed to be from *anthisteri*, to withstand or oppose, referring to the stiff, tough stems.—C. and Z.
Anthocephalus, Rich.	Rubia.	1834	meaning flower heads; the flowers are crowded in terminal, globose, peduncled, solitary heads.
Anthurium, Schott.	Araceæ	1829	from *anthos* and *oura* (a tail); the inflorescence appears to form a tail to the bract.—N. *Tail-flower.*
Antiaris, Lesch.	Urti.‡	1810	*antiar*, its Javanese name. *Upas Tree.*
Anticharis, Endl.	Scroph.	1839	*anti*, against, *charis*, grace.
Antidesma, (Burm.) L.	Euphor.	1745	from *anti*, instead of, and *desmos*, a chain; in allusion to the fibrous nature of the bark.
Antigonon, Endl.	Polygon.	1837	from *anti*, against or opposite, and *gonia*, an angle.—N.
Antirrhinum, (Tourn.) L.	Scroph.	1735	from *anti*, like, and *rhin*, a snout; in allusion to the shape of the corolla.—N. *Snapdragon.*
Aphnamixis, Bl.	Melia.	1825	
Aphelandra, R. Br.	Acanth.	1810	from *apheles*, simple, and *aner*, a male; in allusion to the *one* called anthers.—N.

‡ Moraceæ in E. & P.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Apium, (Tourn.) L.	.. Umbel.	1735	.. from Celtic *apon*, water; a habitat name.—N. *Celery.*
Apluda, L.	.. Gram.	1753	.. meaning chaff.
Apocopis, Nees.	.. Gram.	1841	.. *apokopto*, to cut off; the glumes are truncate.
Apodytes, E. Mey.	.. Olacin.	‡‡1838	.. *apoduo*, to strip oneself.
Aponogeton, L. f.	.. Naiad. §	1781	.. from Celtic *apon*, water, and *geton*, a neighbour; so named because of the aquatic habitat.—N.
Aporosa, Bl.	.. Euphor.	1824	.. *a*, negative, *poros*, a passage or pore.
Aquilegia, (Tourn.) L.	.. Ranun.	1735	.. from *aquila*, an eagle; in reference to the form of the petals.—N. From *aquilegus*, water-drawer, not from aquila, eagle.—B. *Columbine.*
Arachis, L.	.. Leg. P.	1735	.. from *a* and *rachis*, without an axis, or prostrate.—N.
Arachnanthe, Bl.	.. Orchid.	1828	.. *arachne*, a spider, and *anthos*, a flower.
Aralia, (Tourn.) L.	.. Aralia.	1735	.. meaning said to be unknown.—N. *Angelica-tree.*
Araucaria, Juss.	.. Conifer.	1789	.. from its native name in Chili.—N.
Arbutus, (Tourn.) L.	.. Eric.	1735	.. from Celtic *arboise*, an austere bush; in allusion to the fruit.—N.
Archontophœnix, Wendl. and Dr.	Palm.	1875	.. from *archon*, chief, and *Phœnix*, palm.
Ardisia, Sw.†	.. Myrsi.	1788	.. from *ardis*, a spear point; the petals and anthers are acute.
Arduina, Mill.	.. Apocyn.	1759	.. after P. Arduini, a botanist of Padua in the time of Linnæus.—N.
Areca, L.	.. Palm.	1753	.. from its native name in Malabar.—N. *Betelnut Palm.*
Arenaria, (Rupp.) L.	.. Caryo.	1735	.. from L. *arena*, dry; growing in arid places.—N. *Sandwort.*
Arenga, Labill.†	.. Palm.	1801	.. a name of doubtful origin.—N.; from its native name in the Moluccas. *Sugar Palm* or *Sago Palm.**
Argemone, (Tourn.) L.†	Papaver.	1735	.. from *argema*, cataract; a medicinal name used by Dioscorides.—N. *Devil's-fig* or *Mexican Poppy.*
Argostemma, Wall.	.. Rubia.	1824	.. meaning a silvery crown; in allusion to the white umbels.
Argyreia, Lour.†	.. Convol.	1790	.. from *argyreios*, silvery; the leaves are such on the under surface.—N. *Silver Weed.*
Argyrolobium, E. and Z.	Leg. P.	1835	.. in allusion to the silky or villous pods.
Ariopsis, Grah.	.. Araceæ.	1839	.. *Arum opsis*; resembling Arum.—N.

‡‡ Icacinaceæ in E. & P.
§ Aponogetonaceæ in E. & P.
* B. N. H. S. Journal, Vol. XXII, p. 448.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Arisæma, Mart.†	.. Araceæ.	1831	.. from *aron*, Arum, and *sana*, a standard; allied to the Arum.—N.
Aristida, L.	.. Gram.	1753	.. from *arista*, an awn; the floral glume is usually tipped by three very long capillary awns.
Aristolochia, (Tourn.) L. †	Aristo.	1735	.. from *aristos*, best, and *locheia*, parturition; a medicinal name.—N. *Pelican-flower.*
Arnebia, Forsk.	.. Borag.	1775	.. its Arabian name.—N.
Artabotrys, R. Br.†	.. Anona.	1820	.. from *artao*, to suspend, and *botrys*, a bunch; in allusion to the apocarpous, hanging berries.—N. *Hirva Champa.*
Artanema, Don.*	.. Scroph.	1829	.. from *artao* and *nema* (a filament); in reference to a tooth-like process growing on the longer filaments.—N.
Artemisia, L.	.. Compo.	1735	.. from Artemi, Diana; the plant is supposed to cause precocious puberty.—N. *Absinthe* or *Wormwood* and *Tarragon.*
Arthraxon, P. B.	.. Gram.	1812	.. the rachis is very slender, arcuate and fragile.
Arthrocnemum, Moq.	Cheno.	1840	.. from *arthron*, a joint, and *knemos*, a limb; the plants are fleshy, leafless, and jointed.
Artocarpus, Forst.†	.. Urti. **	1776	.. from *artos*, bread, and *carpos*, the fruit.—N. *Bread-fruit* and *Jak.*
Arum, (Tourn.) L.	.. Araceæ.	1735	.. from *aron*; probably of Egyptian extraction.—N. *Lords-and-ladies* or *Cuckoo-pint.*
Arundinella (Raddi.)	.. Gram.	1823	.. meaning a small reed.—N.
Arundo, (Tourn.) L.	.. Gram.	1737	.. meaning a reed.—N. *Great Reed.*
Asclepias, L.	.. Asclep.	1737	.. after the Greek name of Æsculapius of the Latins.—N.
Asparagopsis, Kth.††	.. Lil.	1842	.. looking like Asparagus.—N.
Asparagus, (Tourn.) L. †	Lil.	1735	.. *a*, intensive, and *sparasso*, to tear; in allusion to the strong prickles.—N.
Asperula, L.	.. Rubia.	1735	.. from *asper*, rough; in allusion to the leaves.—N. *Woodruff.*
Asphodelus, (Tourn.) L. †	Lil.	1735	.. from *a*, not, and *sphallo*, to supplant; not to be supplanted in beauty.—N. *Asphodel.*
Aspidistra, Gawl.	.. Lil.	1823	.. from *aspidiseon*, a little round shield, in reference to the form of the flower. *Parlour Palm.*
Aspidopterys, A. Juss.	Malpigh.	1840	.. from *aspis*, a shield, and *pteron*, a wing; the fruits are roundish and winged.

* D. Don in Index Kewensis.
†† Baker in E. & P.
** Moraceæ in E. & P

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Aster, (Tourn.) L.	Compo.	1735	meaning a star.—N. *Star-flower.*
Asteracantha, Nees.	Acanth.	1832	in allusion the spines that surround the whorl of flowers.—N.
Astragalus (Tourn.) L.	Leg. P.	1737	a Greek name.—N.
Astylis, Wight.	Euphor.	1853	the orbicular stigma is seated like a mushroom directly on the ovary—hence the name.
Asystasia, Bl. †	Acanth.	1826	meaning not clear.—N.
Atalantia, Corr.	Ruta.	1805	after Atalanta, the daughter of Schœneus.—N. *Venus' Golden Apple.*
Atriplex, (Tourn.) L.	Cheno.	1735	the Latin name for the *Orache.*—N.
Atylosia, W. & A.	Leg. P.	1834	*a*, without, *tylos*, a callus; the standard is without the hard basal protuberances characteristic of some genera.—C.
Avena, L.	Gram.	1735	derivation obscure.—N. *Oats.*
Averrhoa, L. †.	Geran. *	1735	after Averrhœs of Cordova; an Arabian physician who translated Aristotle into Arabic.—N. *Bilimbi* and *Carambola* or *Kamrakh.*
Avicennia, L.	Verben.	1735	after Ali-ben-Shina—a Persian philosopher, 980-1036.
Axonopus, P. B.	Gram.	1812	*axon*, an axle, *pous*, a foot.
Azadirachta, A. Juss.	Melia.	1830	from its Persian name *Azederakht.*
Azima, Lam.	Salvador.	1789	from *azimena*, the Madagascar name of an allied shrub.
Baccaurea, Lour.	Euphor.	1790	after Baccus; in allusion to the golden coloured berries.
Balanites, Del.	Sima. * *	1813	from *balanos*, an acorn; in allusion to the woody drupes.
Balanophora, Forst.	Balano.	1776	bearing clubs; the flowers are intermixed with clavate bodies.
Baliospermum, Bl.	Euphor.	1825	from *balios*, spotted, and *spermum*, a seed; the seeds are mottled.
Balsamodendrum, Kth.‡	Burser.	1824	meaning the Balsam Tree.—N.
Bambusa, Schreb.†	Gram.	1789	from its Malaya name.—N. *Bamboo.*
Banisteria, L.	Malpigh.	1740	after Joseph Baptist Banister, a traveller in Virginia in the seventeenth century.—N.
Barleria, L.†	Acanth.	1737	after Rev. James Barrelier of Paris of the seventeenth century.—N.
Barringtonia, Forst.†	Myrt. §	1776	after the Hon. Daines Barrington, F.R.S.—N.
Bartonia, Muhl.	Gent.	1801	after Benjmin S. Barton, M. D., of Philadelphia.—N.
Basella, (Rheede) L.	Cheno. ‖	1747	from its native name in Malabar.—N.

* Oxalidaceæ in E. & P.
** Zygophyllaceæ in E. & P.
‡ Cooke gives Balsamodendron, Kth.
§ Lecythidaceæ in E. & P.
‖ Basellaceæ in E. & P.

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Bassia, (Kön) L.†	.. Sapota.	1771	.. named after Signor Ferdinando Bassi of Bologna Gardens.—N. *Moh* or *Mohvda*.
Batatas, Choisy.	.. Convol.	1833	.. a Mexican name.—N. *Sweet Potato*.
Bauhinia, L. †	.. Leg. C.	1737	.. after John and Caspar Bauhin of the sixteenth century who were brother botanists; the wings of the leaves are also didymous.—N. *Apta* or *Jinji*.
Beaumontia, Wall.†	.. Apocyn.	1824	.. after Lady Diana Beaumont (Drury); after Mrs. Beaumont, formerly of Breton Hall, Yorkshire.—N. and B.
Begonia, (Tourn.) L.†	.. Begon.	1742	.. in honour of M. Begon, a French patron of botany.—N.
Beilschmiedia, Nees.	.. Laura.	1831	.. Commemorative?
Belamcanda, Adans.	.. Irideæ.	1763	.. the Malabar name of the plant.—Z.
Bellis, (Tourn.) L.	.. Compo.	1737	.. from L. *bellus*, pretty.—N. *Daisy*.
Beloperone, Nees.	.. Acanth.	1832	.. from *belos*, a dart, and *peronne*, a band; the connective is arrow-shaped.—N.
Benincasa,‡ Savi.	.. Cucur.	1818	.. in honour of the Italian Count Benincasa. *White-gourd* or *Waxy-gourd*.
Bentinckia, Berry.	.. Palm.	1814	.. after William Henry Cavendish-Bentinck, Governor-General of the East Indies, 1774-1839.*
Bergera, Kön.	.. Ruta.	1771	.. after J. C. Berger, a Danish botanist.—N.
Bergia, L.	.. Elatin.	1771	.. in honour of P. J. Bergius, professor at Stockholm.
Berthelotia, DC.	.. Compo.	1836	.. named after M. Berthelot, who illustrated the Flora of the Canary Islands. (The Brazil-nut is *Bertholletia excelsa*; B. in honour of Louis Claude Berthollet, a French chemist.)
Beta, (Tourn.) L.	.. Cheno.	1735	.. from Celtic *bett*, red.—N. *Beet*.
Bidaria, Decne.	.. Asclep.	1844	.. from its Indian name.—Z.
Bidens, (Tourn.) L.	.. Compo.	1737	.. from *bis* and *dens*, in allusion to the *two teeth* at the apex of the achenes.—N. *Bur-marigold*.
Bignonia, (Tourn.) L.	.. Bignon.	1735	.. in memory of Abbe Bignon, Librarian to Louis XIV††.
Billbergia, Thunb.	.. Bromel.	1823	.. after J. G. Billberg, a Swedish botanist.—N.
Biophytum, DC.	.. Geran.**	1824	.. from *bois*, life, and *phyton*, a leaf; in allusion to the sensitiveness of the leaves.—N.

‡ *Benicasa* in Cooke, a misprint.
* B. N. H. S. Journal, Vol. XXII., p. 461.
†† N. gives Louis IV, a misprint.
** Oxalidaceæ in E. & P.

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Bischofia, Bl.	Euphor.	1825	after G. W. Bischof, a botanist.
Bixa, L.	Bixa.	1737	its South American name.—N. *Arnatto-seeds* or *Annatto-seeds.*
Blachia, H. Bn.	Euphor.	1858	after Dr. Blache, a friend of the nomenclator.—Z.
Blainvillea, Cass.	Compo.	1823	after Blainville.
Blastania, Kotschy & Peyr.	Cucurbit.	1865	from *blastanein*, to sprout; c.f. *Bryonia* which is similarly derived.—Z.
Blepharis, Juss.	Acanth.	1789	meaning an eyelash; probably alluding to the fringed calyx.—N.
Blepharispermum, Wight.	Compo.	1834	obviously in allusion to the achenes, which are compressed and black, and have ciliate margins and a ciliate rib on the outer or both the faces.
Bletia, R. & P.	Orchid.	1794	after Don Louis Blet, a Spanish botanist.—N.
Blighia, Kön.	Sapind.	1806	after W. Bligh, British mariner, who wrote on a voyage in the South Seas, 1792.
Blumea, DC.	Compo.	1833	named after the botanist Karl. L. Blume.
Blyxa, Noronha.	Hydroch.	1806	from *bluxein*, to flow; a habitat name (occupying brooks).—Z.
Bocagea, St. Hil.	Anona.	1825	after the geographer Barbié du Bocage of Paris, 1760-1825.—Z.
Bocconia, (Plum.) L.	Papaver.	1737	after Paolo Bocconi, a Sicilian botanist.—N.
Bœhmeria, Jacq.	Urti.	1760	after George Rudolph Boehmer, a German botanist.—N. *Rhea.*
Bœrhaavia, (Vaill.) L. §	Nyctag.	1735	after the Ledyen physician H. Boerhaave.
Bombax, L.†	Malva.*	1753	Greek for Cotton.—N. *Silk-cotton.*
Bonamia, Thou.	Convol.	1804	named in honour of the French botanist Franz Bonami, 1719-1786.—Z.
Bonnaya, Link. & Otto.	Scroph.	1820	after Bonnay, a German botanist.—N.
Borago, L.	Borag.	1753	derivation uncertain.—N.
Borassus, L.	Palm.	1736	a name given to the spathe of a Date-palm.**—N. *Palmyra Palm.*
Bosea, L.	Urti.	1737	after Kaspar Bose, German amateur of plants at Leipzig, about 1700.—B.
Boswellia, Roxb. †	Burser.	1807	after Dr. Boswell, formerly of Edinburgh.—N.
Boucerosia, W. & A.	Asclep.	1834	from *boukeros*, buffaloes' horns; the corona lobes suggested the analogy.—N.

§ *Bœrhavia* in E. & P.
* Bombaceæ in E. & P.
** See, however, this Journal, Vol. XXI., p. 929.

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Bouchea, Cham.	Verben.	1832	after C. and P. Bouche, German naturalists.—N.
Bougainvillæa, Comm.	Nyctag.	1789	after De Bougainville, French navigator.—N.
Boussingaultia, H. B. K.	Cheno.‡	1825	after Boussingault, a chemist.—N.
Brachycome, Cass.	Compo.	1825	from *brachis*, short, and *come*, hair.—N.
Brachypterum, Benth...	Leg. P.	1838	from *brachis* and *pteron*; the pods are winged shortly on both sides.
Brachyramphus, DC.	Compo.	1838	*Brachys*, short, *ramphos*, a beak.
Bragantia, Lour.	Aristoloch.	1790	after the Duke of Braganza.
Brassaia, Endl.	Aral.	1839	
Brassica, (Tourn.) L.	Crucifer.	1735	an ancient name.—N. *Cabbage.*
Breweria, R. Br.	Convol.	1810	after S. Brewer.
Breynia, Forst.	Euphor.	1776	after J. P. Breya, a German botanist.
Bridelia, Willd.	Euphor.	1805	after professor S. E. Bridel-Briderí, a Swiss botanist of the eighteenth century.
Brindonia, Thou.	Guttifer.	1804	*Brindon*, the Portuguese name.
Briza, L.	Gram.	1735	*briza*, to nod.—N. *Quaking-grass.*
Bromelia, (Plum.) L.	Bromel.	1735	after Bromel, a Swedish botanist.—N.
Broussonetia, L'Hér.	Urti.**	1799	after P. N. V. Broussonet, a French naturalist.—N. *Papertree.*
Browallia, L.	Solan.	1737	after John Browall, Bishop of Abo, who wrote in defence of the Linnæan System in 1739.—N.
Brownea, Jacq.	Leg. C.	1760	after P. Browne, the author of a History of Jamaica.—N.
Brugmansia, Pers.	Solan.	1805	Commemorative? *Peruvian-trumpet-flower.*
Bruguiera, Lam.	Rhizo.	1796	Commemorative?
Brunfelsia,* (Plum.) L.	Solan.	1737	after Otto Brunfels of Mentz.; he published the first good figures of plants in 1530.—N.
Bryonia, L.	Cucurbit.	1735	from *bryo*, to sprout; the plants have tubers that sprout every year.—N. *Bryony.*
Bryonopsis, Arn.	Cucurbit.	1841	looking like *Bryonia.*
Bryophyllum, Salisb†	Crassul.	1805	in allusion to the habit of the leaves to sprout by developing adventitious buds.—N.
Buchanania, Spreng.	Anacard.	1800	after Buchanan-Hamilton, an Indian botanist.
Buchnera, L.	Scroph.	1737	after J. G. Buchner, a German naturalist.
Buddleia, (Houst.) L.†	Logan.	1737	after A. Buddle, an English botanist.—N.

‡ Basellaceæ in E. & P.
** Moraceæ in E. & P.
* Cooke gives *Brunsfelsia*, a misprint.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Buettneria, Loefl.	Stercul.	1758	after David Sigismond Augustus Bytner, a professor of botany at Gottingen.—N.
Bulbophyllum, Thou.†	Orchid.	1822	the leaves spring from the pseudo-bulb; hence the name.—N.
Bulbostylis, Raf.*	Cyper.	..	the nut is crowned by the persistant style base.
Bupleurum, (Tourn.) L.	Umbel.	1735	the derivation not satisfactorily explained.—N.
Burmannia, L.	Burmann.	1735	after J. D. Burmann, a Dutch botanist.
Bursinopetalum, Dalz. & Gib. *	Corn.	..	meaning petals saccate; the petals are, however, not saccate in the Bombay species.
Butea, Kön. †	Leg. P.	1795	after John, Earl of Bute, a munificent patron of botany.—N. 1713-1792, *Palas* or *Khakhar*.
Butomopsis, Kth.	Alisma.	§1841	looking like *Butomus*.
Butomus, L.	Alisma.	§1735	from *bous*, ox, and *temno*, to cut the sharp leaves out the mouths of cattle.—N.
Cacalia, L.	Compo.	1753	a name used by Dioscorides.—N.
Cadaba, Forsk.	Capparid.	1775	from the Arabic name *Kadhab*.—Z.
Cæsalpinia, L. †	Leg. C.	1753	after Andreas Cæsalpinus, an Italian botanist, 1519-1603.—N. *Fever-nuts* and *Divi-divi*.
Cæsulia, Roxb.	Compo.	1795	from *cæsus*, beaten; growing in spite of being trampled upon.
Cajanus, DC.	Leg. P.	1813	*Catchang* is its Amboyna name.—N. *Tur* or *Pigeon-pea*.
Calacanthus, ** T. Anders.	Acanth.	1876	*Kalos*, beautiful, *a canthos*, spine.
Caladium, Vent.	Araceæ.	1800	derivation doubtful.—N.
Calamus, L.†	Palm.	1753	from *kalamos*, a reed; cf. *kalam*.—N. *Cane Palm*.
Calanthe, R. Br.	Orchid.	1821	from *kalos anthos*, beautiful flowers.—N.
Calathea, G. F. Mey.	Scitamin.	‡1818	from *calathos*, a basket; the stigma is basket-shaped.—N.
Calceolaria, L.	Scroph.	1771	from *calceolus*, a little slipper; in allusion to the form of the corolla; probably also includes a reference to F. Calceolari, an Italian botanist of the sixteenth century.—N. *Slipperwort*.
Calendula, L.	Compo.	1735	from *calendæ*, the first day of the month.—N. *Marigold*.
Calliandra, Benth.	Leg. M.	1840	from *kallos* and *andros*; in reference to the elegant stamens.—N.

§ Butomaceæ in E. & P.
* Not found in Index Kewensis.
‡ Marantaceæ in E. & P.
** Calacantha in Index Kewensis.

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Callicarpa, L.	Verben.	1741	meaning beautiful fruits.—N.
Callichroa, F. & M.	Compo.	1835	from *kallos* and *chroa*; referring to the bright color of the flowers.—N.
Calligonum, L.	Polygon.	1737	meaning beautiful angles; the nodes are tumid; the ovary is 4-gonous, and the angles are variously crested, winged, echinate or setose.
Calliopsis, Rchb.	Compo.	1824	looking beautiful; what?
Callistemma, Boiss.	Dipsa.	1875	*Kallos*, beautiful, and *stemma*, a chaplet.
Callistemon, R. Br.	Myrt.	1814	alludes to the beauty of the stamens.—N.
Callistephus, Cass.	Compo.	1825	alludes to the beautiful crown or corona on the top of the fruit.—N. *Aster*.
Calonyction,** Choisy.	Convol.	1833	means a night beauty; the flowers are nocturnal.—N.
Calophanes, D. Don.	Acanth.	1833	from *kalos* and *phaino*, appearing beautiful.—N.
Calophylium, L.†	Guttifer.	1737	having beautiful leaves.—N. *Alexandrine-laurel*.
Calosanthes,* Bl.	Bignon.	1826	from *kalos* and *anthos*; in allusion to the beauty of the flowers.
Calotropis, R. Br.	Asclep.	1809	from *kalos* and *tropis* (a keel); in allusion to the beautifully curved staminal appendages.—N. *Ak*.
Calycopteris, Lam	Combret.	1794 ?	the fruit bears wings which are derived from the calyx.—N.
Calysaccion, Wight.	Guttifer.	1840	the calyx forms two reflexed valves.
Campanula, (Tourn.) L.†	Campanul.	1735	diminutive of *campana*, a bell; in allusion to the bell-shaped corolla.—N. *Canterbury-bells*.
Campsis, Lour.	Bignon.	1790	from *kampsis*, a curving.
Campylanthus, Roth.	Scroph.	1821	the corolla tube is elongate, slender, and incurved.
Cananga, Rumph.	Anona.	1855	from its Malay name.
Canarium, (Rumph.) L.†	Burser.	1754	from *canari*, its Malay name.—N. *Canary*.
Canavalia, DC. †	Leg. P.	1825	from its Malabar name.—N. *Sword-bean*.
Canella, P. Br.	Canell.	1756	a diminutive of *canna*, a reed; the bark is rolled like a reed as in the cinnamon.—N.
Canna, L.	Scita.‡	1735	probably from Celtic *cana*, a cane.—N. *Indian-shot*.
Cannabis, (Tourn.) L.	Urti.	††1735	from Sanskrit *canam*.—N. *Hemp*.

** Doubtfully wild.
* *Calosanthus* in Durand's Index.
‡ Cannaceæ in E. & P.
†† Moraceæ in E. & P.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Canscora, Lam.	Gentian.	1783	from its native name in Malabar.—N.
Cansjera, Juss.	Olaca.	1789	the Malabar name latinized.
Cantharospermum, W. & A.	Leg. P.	1834	seeds resembling beetles; the seeds are strophiolate in *C. pauciflorum*, Syn. *Atylosia scarabioides*.
Canthium, Lam.	Rubia.	1783	beetle-like.
Capparis, (Tourn.) L.	Capparid.	1735	from Persian *kabar*, capers.—N. *Caper-tree*.
Capselia, Medik.	Crucifer.	1792	from *Capsula*, a little box or chest; the pod is referred to.—C. *Shepherd's-purse*.
Capsicum, (Tourn.) L.	Solan.	1735	from *kapto*, to bite; in allusion to the hot taste.—N. (Cf. *Allium*). *Chili* or *Red-pepper*.
Caraguata, (Plum.) Lindl.	Bromel.	1827	from its South American name.—N.
Carallia, Roxb.	Rhizophor.	1814	from its Telangu name.—N.
Caralluma, R. Br.†	Asclep.	1809	from *Carallum*, its Telangu name.—N.
Carapa, Aubl.	Melia.	1775	a native name in Guiana.—N.
Cardamine, (Tourn.) L.	Crucifer.	1775	a diminutive of *Cardamom*, Cress; used by Dioscorides.—N. *Cackoo Flower*.
Cardanthera, Buch-Ham.	Acanth.	1847	from *kardia*, the heart, and *anthos*, flower.
Cardiospermum, L.†	Sapind.	1735	so named because of the seeds usually bearing a heart-shaped aril. *Baloonvine*.
Carex, (Dillen.) L.	Cyper.	1735	from *keiro*, to cut; in allusion to the sharp margins.—N.
Careya, Roxb.	Myrt.*	1814	after Rev. William Carey of Serampore, a botanist and a linguist.—N.
Carica, L.	Passiflor.**	1737	erroneously supposed to be a native of Caria.—N. *Papaw* or *Papaya*.
Carissa, L.	Apocyn.	1767	from its Sanskrit name.
Carludovica, R. & P.	Cyclanth.	1794	after Charles IV of Spain and Louisa, his Queen.—N.
Caroxylon, Thunb.	Chenopod.	1782	
Carthamus, (Tourn.) L.	Compo.	1735	from Arabic *qurtom*, to paint; a dye is extracted from the petals.—N. *Safflower*.
Carum, (Rup.) L.†	Umbel.	1735	from *karos*, the Greek name used by Dioscorides.—N. *Caraway*.
Caryopteris, Bunge	Verben.	1835	meaning a winged nut.—N.
Caryota, L.†	Palm.	1737	the old Greek name for a species of the date.—N. *Toddy Palm*.
Casearia, Jacq.	Samyd.	1760	after J. Casearius, who assisted Rheede in the *Hortus Malabaricus*.—N.

* Lecythedaceæ in E. & P.
** Caricaceæ in E. & P.

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Cassia, (Tourn.) L.†	Leg. C.	1735	Greek *Kasia* of Dioscorides.—N. *Senna, Indian-laburnum* and *others.*
Cassytha, L.	Laura.	1753	Greek for *Cuscuta* which it resembles. *Dodder.*
Castanospermum, A. Cunn.	Leg. P.	1830	*kastanon sperma*: the seeds taste like chestnuts.—N. *False-Chestnut.*
Castilloa, Cerv.	Urti.*	1794	probably commemorative of D. Castillejo, a botanist of Cadiz. —N. *Castilloa-rubber-tree.*
Casuarina, Forst.	Casuarin.	1759	supposed to be derived from the resemblance of the drooping branches to the feathers of the Cassowary.—N. *Beef-wood tree.*
Catesbæa, L.	Rubia.	1737	after Mark. Catesby, a botanist, contemporaneous with Linnæus. —N. *Thorn-lily.*
Catharanthus, G. Don.	Apocyn.	1836	*Kathairo*, to purge, *anthos*, flower.
Caturus, L.	Euphor.	1767	*Katta*, a cat, *ouros*, a tail. *Cat's tail.*
Cedrela, P. Br.**	Melia.	1756	a diminutive of *Cedrus*, Cedar; the aroma of the wood is alike in the two.—N.
Celastrus, L.	Celas.	1737	from an old Greek name.—N.
Celosia, L.†	Amarant.	1737	from *kelos*, burnt; the flowers in some appear to be such.—N. *Cockscomb.*
Celsia, L.	Scroph.	1735	in honour of Olaus Celsius of the University of Upsal, 1670-1756. —N.
Celtis, (Tourn.) L.	Urti.‡	1737	the name used by Pliny for the Lotus.—N.
Cenchrus, L.	Gram.	1737	*Kenchros*, a kind of millet.
Centaurea, L.	Compo.	1737	it is said to have cured a wound in the foot of Centaur Chiron, caused by an arrow of Hercules. —N. *Blue-bonnets.*
Centipeda, Lour.	Compo.	1790	*centum*, hundred, *pes*, a foot.
Centotheca, Desv.	Gram.	1810	from *kentein*, to prick, and *theca*, a receptacle; in allusion to the retrorse hairs on the upper florets.—N.
Centranthera, R. Br.	Scroph.	1810	from *kentron*, a spur, and *anthera*, the anthers; the anthers are spurred at the base.
Centratherum, Cass.	Compo.	1817	*Kentron*, a spur, and *antheros*, a flower.
Centrosolenia, Benth.	Gesner.	1846	from *kentron* and *solen* (a tube); the corolla tube is spurred.—N.
Centunculus, (Dill.) L.	Primul.	1735	dim. for *cento*, a coarse coverlet; the top of the capsule comes off like a lid.

* Moraceæ in E. & P.
** Cedrela, L in Cooke, E. & P. and Benth & Hook. f.
‡ Ulmaceæ in E. & P.

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Cephalandra, Schrad...	Cucur.	1836	.. from *kephale* and *andros*; the anthers are connate, forming a *capitum*.
Cephalocroton, Hochst..	Euphor.	1841	.. *kephale*, head, and *kroton*, a tick.
Cephalostigma, A. DC.	Campanul.	1830.	so named in reference to the capitate stigmas.
Cerastium, (Dill.) L...	Caryopyll.	1735..	from *ceras*, a horn; the capsules bear the shape of horns.—N.
Ceratogynum, Wight...	Euphor.	1852	.. ovary horn-shaped.
Ceratonia, L.	.. Leg. M.	1735	.. from *ceratos*, a horn; the pod is referred to.—N. *Algaroba-bean* or *Carob-tree*.
Ceratophyllum, L...	Cerato.	1735	.. in allusion to the terete, pointed, horn-like divisions of the leaves.
Ceratotheca, Endl.	.. Pedalin.	1832	.. so named in allusion to the horned fruit.—N.
Cerbera, L.†	.. Apocyn.	1737	.. after Cerberus, whose bite was poisonous; in allusion to the poisonous properties.—N.
Cereus, Mill.	.. Cact.	1768	.. from *cereus*, pliant.—N.
Ceriops, Arn.	.. Rhizo.	1838	.. from *keria*, a scarf, and *ops*, to resemble; in reference to the fleshy ring-like disk.—Z.
Ceropegia, L. †	.. Asclep.	1737	.. the flowers are imagined to look like a fountain of wax; from *keros* and *pege*.—N.
Cestrum, L.	.. Solan.	1737	.. an ancient Greek name.—N.
Chailletia, DC.	.. Chaillet.	1811	.. commemorative?
Chamæraphis, P. Br..	Gram.	1810	.. from *chamai*, dwarf, and *raphis*, a needle; the peduncles of the spikelets are produced as awn-like bristles beyond the ultimate spikelet.
Chamærops, L.	.. Palm.	1737	.. from *chamai* and *rhops*, meaning a low bush.—N. *Dwarf Fan-palm*.
Chamissoa, H. B. K.	.. Amarant.	1817	.. in honour of Louis Charles Albert von Chamisso, the companion of Kotzebu; 1781-1838.—N.
Charieis, Cass.	.. Compo.	1817	.. from *charis*, grace.—N.
Chasalia, Comm.	.. Rubia.	1830	.. gaping?
Chavica, Miq.	.. Piper.	1843	.. from its native name in Malabar.
Cheiranthus, L.	.. Crucifer.	1737	.. from *cheir*, hand, and *anthos*, a flower.—N. *Wall-flower*.
Cheirostylis, Bl.†	.. Orchid.	1825	.. the projecting *column* is ridged like the fingers of a *hand*.—N.
Chenolea,* Thunb.	.. Chenopod.	1781	. from *chen*, a goose, *olea*.
Chenopodium, (Tourn.) L.†	Chenopod.	1735	. from *chen*, a goose, and *pous*, a foot; in allusion to the fancied resemblance in the leaves.—N.
Chickrassia, A. Juss.	.. Melia.	1830	.. from the vernacular name in Chittagong.

* Doubtfully indigenous.

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Chiococca, (P. Br.) L.	Rubia.	1759	from *chion*, snow, and *kokkos*, a berry; the berries are white.—N. *Snowberry.*
Chirita, Ham.	Gesner.	1825	an Indian name.—N.
Chloris, Sw.	Gram.	1788	from *chloros*, green.—N.
Chlorocodon, H. f.	Asclep.	1871	from *chloros*, green, and *kodon*, a bell; the flowers are such.—N.
Chlorophytum, Ker.†	Lilia.	1808	not an exclusive character by any means, nor uncommon (*chloros* and *phyton*).—N.
Chloroxylon, Rumph.**	Melia.	1777	the wood is yellow.—N. *Satinwood-tree.*
Chonemorpha, G. Don.†	Apocyn.	1836	from *chone*, a funnel, and *morphe*, form; the corolla is funnel-shaped.
Chorisandra, Wight.	Euphor.	1853	the stamens are free.
Christisonia, Gardn.	Orobanch.	1847	after Dr. Christison, of Edinburgh.
Chrozophora, Neck.	Euphor.	1790	*Chroa*, colour, *phoros*, bearing.
Chrysalidocarpus, Wendl.	Palm.	1878	*Chrysalis*, a pupa, *Karpos*, a fruit; the fruit deprived of its epicarp has the appearance of a chrysalis. *Yellow Areca Palm.**
Chrysanthemum, (Tourn.) L.	Compo.	1735	from *chrysos* and *anthos*, meaning golden flowers.—N.
Chrysophyllum, L.†	Sapot.	1737	in allusion to the golden undersurface of the leaves.—N. *Starapple.*
Chukrasia,‡ A. Juss.	Melia.	1830	another spelling of the vernacular name.
Cicca, L.	Euphor.	1767	after Peter Cicca, a writer of the sixteenth century.—N.
Cicer, (Tourn.) L.	Leg. P.	1735	from *Kikos*, strength (*Kirkir*, a pea, Persian). *Gram.* Old Latin name for the vetch.—B.
Cichorium, (Tourn.) L.	Compo.	1735	an ancient Egyptian name.—N. *Chicory and Endive.*
Cineraria, L.	Compo.	1763	from *cinerea*, ash-coloured; alluding to the grey down covering the leaves.—N.
Cinnamomum, (Tourn.) L§†	Laura.	1735	from Arabic *kinamon*.—N. *Cinnamon.*
Cipadessa, Bl.	Melia.	1825	the native name in Java.—Z.
Cipura, Aubl.	Irideæ.	1775	derivation unexplained.—N.
Cirrhopetalum, Lindl.†	Orchid.	1824	from *cirrhus* and *petalon*; it is, however, the lateral *sepals* that are usually much elongated like a tendril. (petals—N.)
Cissampelos, L.	Meni.	1737	from *Kissos*, Ivy, and *ampelos*, a vine; in allusion to the ivy-like branches and grape-like fruit bunches.—N. *Ice-vine* or *Velvet-leaf.*

** D. C. in Cooke.
* B. N. H. S Journal. Vol. XXII., p. 667.
‡ *Chukrassia* in Cooke.
§ Bl. (1825) in Cooke.

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Cissus, L.	Ampelid.	1747	from *Kissos*, Ivy.—N.
Cistanche, H. & L.	Orobanch.	1806	from *kistos*, a capsule, and the genus *Orobanche*.—Z.
Citharexylum, L.*	Verben.	1753	from *kithara*, a lyre, and *xylon*, wood; in allusion to the fitness of the wood for preparing musical instruments.—N. *Fiddlewood.*
Citrullus, Forsk.†‡	Cucurbit.	1775	from *citrus*, in allusion to the resemblance in fruits.—N. *Watermelon*
Citrus, L.	Ruta.	1735	after Citron in Judæa (Drury); from *Kitron*.—N. *Orange.*
Claoxylon, A. Juss.	Euphor.	1824	from *klæin*, to break, and *xylon*, wood; the wood is brittle.—Z.
Clarkia, Pursh.	Onagr.	1814	after Captain Clarke, the companion of Capt. Lewis, in his journey to the Rocky Mountains of North America.—N.
Clausena, Burm. f.**	Ruta.	1768	after P. Clausön, a Danish botanist of the seventeenth century.—N.
Cleidion, Bl.	Euphor.	1825	*kleidion*, dim. of *kleio*, a key.
Cleistachne,§ Benth.	Gram.	1881	meaning closed achenes.
Cleistanthus, H. f.	Euphor.	1848	from *kleistos*, shut up, and *anthos*, a flower; the flowers are very minute.
Clematis, (Dill.) L.†	Ranun.	1737	from *klema*, a vine branch; climbers.—N. *Traveller's-joy.*
Cleome, L.†	Capparid.	1735	from *kleio*, close; the flowers are close set.—N. *Spider-plant.*
Clerodendron, L.†	Verben.	1737	from *kleros*, lot, and *dendron*, a tree; in allusion to the uncertain properties of the plants.—N.
Clianthus, Banks & Sol.	Leg. P.	1832	from *kleios*, glory, and *anthos*, a flower.
Clitoria, L.†	Leg. P.	1737	from *clitoris*; an anatomical term in Zoology.—N. *Butterfly-pea.*
Clutia, (Boerh.) L.	Euphor.	1735	named after Augerius Clutius, a Leyden professor of botany.
Clypea, Bl.	Meni.	1825	Shaped like a Roman buckle; the leaves are peltate or broadly cordate.
Cobæa, Cav.	Polemon.	1791	after B. Cobo, a Spanish botanist.—N.
Coccinia, W. & A.	Cucurbit.	1834	meaning scarlet; the fruits are referred to.
Coccoloba, L.	Polygon.	1759	from *coccos*, a berry, and *lobos*, a pod.—N. *Seaside-grape.*
Cocculus, DC.	Meni.	1818	from *Coccus*, cochineal; the berries have that scarlet colour.—N.

* Mill. (1752) in Index Kewensis.
‡ Schrad. in Cooke.
** Burm. in Cooke.
§ Not mentioned by Cooke, save as a synonym.

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Cochlospermum, Kth.†	Bixa.	1822	the seeds are cochleate or shell-like.—N.
Cocos, L.	Palm.	1753	from Portuguese *coco*, a monkey; after a fancied resemblance of the bracts to a monkey's head.—N. *Cocoanut.*
Codiæum, Rumph.	Euphor.	1824	from *codebo*, its Malayan name.—N. *Croton.*
Cœloglossum, Hartm.	Orchid.	1820	*Koilos*, hollow, and *glossa*, tongue.
Coffea, L.	Rubia.	1735	a province in Naria, Africa.—N. *Coffee.*
Coix, L.	Gram.	1737	a name used by Theophrastus.—N. *Job's-tears.*
Cola, Schott. & Endl.	Stercul.	1832	its native name.—N. *Goura-nut* or *Kola-nut-tree.*
Coldenia, L.	Boragin.	1747	in honour of Conwallades Colden, a North-American botanist of the eighteenth century.—N.
Colea, Boj.	Bignon.	1837	in honour of General Sir G. Lowry Cole, a governor of the Mauritius.—N.
Colebrookea, Sm.	Labiat.	1806	in honour of Henry Thomas Colebrooke, a botanist.—N.
Coleospadix, Becc.	Palm.	1885	the spadix is sheathed.
Coleus, Lour. †	Labiat.	1790	from *koleos*, a sheath; the filaments are connate into a sheath separate from the corolla.—N. *Indian-borage.*
Collæa, DC.	Leg. P.	1825	after Luigi Colla, a botanist, who flourished in 1833-37.—Z.
Collinsia, Nutt.	Scroph.	1817	after Zaccheus Collins, once Vice-President of the Academy of Natural Sciences of Philadelphia.—N.
Colocasia, Schott.	Araceæ.	1832	a Greek name.—N. *Taro* or *Allu.*
Colubrina, Rich.	Rhamna.	1827	from *coluber*, a snake; in allusion to the twisted filaments.—N.
Colutea, (Tourn.) L.	Leg. P.	1735	probably from *koluo*, to amputate; the shrubs are said to die if the branches are cut.—N. *Bladder-senna.*
Colvillea, Boj.	Leg. C.	1834	
Combretum, L.†	Combret.	1737	an ancient name.—N.
Cometes, L.	Illeceb.*	1767	probably in allusion to the numerous *comose* pinnatipartite yellowish-red bracts whose ultimate segments are needle-like.
Commelina, (Plum.) L.	Commel.	1735	after Kaspar (1667-1731) and Johann (1629-1698) Commelin, Dutch botanists.—N.
Commiphora, Jacq.†	Burser.	1797	*Kommi*, gum, *phero*, to bear.
Congea, Roxb.	Verben.	1819	after an East Indian name.—B. and Z.

* Caryophyllaceæ in E. & P.

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Connarus, L.	Connar.	1747	an ancient name.—N.
Conocarpus, L.	Combret.	1737	from *konos* and *karpos*, meaning cone-like fruits; the fruits are close set to form a cone.—N.
Conocephalus, Bl.	Urti.	1825	the inflorescence is cone-shaped.
Convolvulus, (Tourn.) L.†	Convol.	1735	from *convolvo*, to twine—a genus of twiners.—N. *Bindweed.*
Conyza, L. *	Compo.	1737	from *conis*, dust; so named from its use as an insect powder.—N. *Fleabane.*
Cookia, Sonn.	Ruta.	1782	after Captain James Cook, the celebrated circum-navigator; killed, 1779.—N *Wampee-tree.*
Corallocarpus, Welw.	Cucurbit.	1867	in allusion to the (coral) red fruits.
Corchorus, (Tourn.) L.	Tilia.	1735	from a Greek term for pot-herb.
Cordia, L.†	Boragin.	1737	in honour of Euricius Cordus, whose true name was Henricus Urbanus—a German botanist, 1486-1535.—N.
Cordyline, Royen.	Lil.	1763	from *kordyle*, a club; the roots are club-like.—N.
Coreopsis, L.	Compo.	1737	from *koris* and *opsis*, in allusion to the bug-like form of the fruit.
Coriandrum, (Tourn.) L.	Umbel.	1735	from *coris* a bug; the leaves have the smell of a bug.—N. *Coriander.*
Cortaderia,**	Gram.		*Cortadora* is the Spanish-American name for the Pampas Grass?
Corypha, L.†	Palm.	1737	from *coryphe*, the summit; these palms bear flowers but once in life, which occupy the *summit.*—N. *Talipot Palm* or *fish-tail Palm.*
Cosmos, Cav.	Compo.	1791	from *kosmos*, beautiful.—N.
Cosmostigma, Wight	Asclep.	1834	in allusion to the beauty of the stigma which is provided with a distinct rim and a slightly umbonate centre.
Costus. L.†	Scitamin.	1736	an ancient name.—N.
Cotoneaster, Rupp.	Rosa.	1745	from *Cotoneum*, the Quince.—N. *Rockspray.*
Cottonia, Wight.†	Orchid.	1852	after Major F. Cotton, Madras Engineers.
Cotyledon, (Tourn.) L.	Crassul.	1735	so named after the shape of the leaves.—N.
Couroupita, Aubl.	Myrt.‡	1775	its native name.—N. *Cannon-ball-tree.*
Courtoisia,§ Nees.	Cyper.	1834	after Richard Joseph Courtois, 1806—1835, professor at and director of the Botanical Gardens at Liege.—Z.

* Less. (1832) in Cooke.

**Not found in Index Kewensis.

‡ Lecythedanceæ in E. & P.

§ Doubtfully indigenous.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Covellia, Gasp.	.. Urti.**	1844	.. after the English botanist John Cowell, who flourished in 1730. —Z.
Cratæva, L.	.. Capparid.	1735	.. after Cratevas, a Greek botanist who lived in the time of Hippocrates.—N. *Wayvarana.*
Crescentia, L.	.. Bignon.	1735	.. after Pietro Crescenzi, an Italian writer on agriculture in the thirteenth century.—N. *Calabash-tree.*
Cressa, L.	.. Convol.	1747	.. from Crete ; a geographical name.
Crinum, L.†	.. Amaryll.	1737	.. from *Krinon*, its Greek name.—N.
Crocosmia, Planch.	.. Irideæ.	1851	.. from *Crocus*, Saffron, and *osme*, smell; in allusion to the odour of saffron exhaled by the dried flowers when immersed in warm water.—N.
Crossandra, Salisb†	.. Acanth.	1806	.. from *krossos*, a fringe, and *aner*, a man; the anthers are fringed. —N.
Crossostephium, Less.	.. Compo.	1831	.. fringed crown ?
Crotalaria, (Dill.) L.†	Leg. P.	1737	.. from *krotalon*, a rattle; the ripe pods form a rattle.—N. *Bombay-hemp.*
Croton, L.	.. Euphor.	1737	.. from *kroton*, a tick; after a resemblance in the seeds.—N.
Cryptanthus, Otto & Diet.	Bromel.	1836	.. the flowers are hidden among the bracts.—N.
Cryptocarya, R. Br.	Laura.	1810	.. from *kryptos* and *karyon*, in allusion to the *fruit* being *hidden* within the perianth tube.
Cryptocoryne, Fisch.	Araceæ.	1828	.. from *kryptos* and *koryne* (a club); the spadix is hidden by the hooded [spiral] spathe.—N.
Cryptolepis, R. Br.	.. Asclep.	1809	.. probably in allusion to the corona-scales which arise from about the middle of the corolla-tube.
Cryptophragmium, Nees	Acanth.	1832	.. from *kryptos* and *phragmion* (a partition); alluding to the divisions of the cells of the anthers.
Cryptostegia, R. Br.	.. Asclep.	1819	.. from *kryptos* and *stege*, a cover ; in reference to the scales in the throat covering the anthers.—N.
Ctenolepis, H. f.	.. Cucurbit.	1867	.. probably in allusion to the simple, capillary tendrils.
Cucumis, (Tourn.) L.†	Cucurbit.	1735	.. derivation obscure.—N. *Cucumber* and *Melon.*
Cucurbita, (Tourn.) L.	Cucurbit.	1735	.. from *cucumis*, the cucumber, and *orbis*, the globe.—N. *Pumpkin* or *Gourd.*
Cuminum, (Tourn.) L.	Umbel.	1735	.. the Latin name of the plant. *Cummin.*

** Moraceæ in E. & P.

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GENUS AND AUTHOR.	NATURAL ORDER.	DATE.	DERIVATION AND COMMOM NAME.
Cupania, (Plum.) L.	Sapind.	1737	after Father Francis CUPANI, an Italian monk.—N. *Akee-tree.*
Cuphea, P. Br.	Lythr.	1756	from *kyphos*, a curved ; in allusion to the curved capsule.—N.
Cupressus, (Tourn.) L.	Conifer.	1737	from *kuo*, to produce, and *parisos*, equal ; in reference to the symmetrical growth.—N. *Cypress.*
CURCULIGO, Gärtn.†	Amaryll.	1788	from *curculio*, a weevil ; after the beak of the seeds that suggested the analogy.—N. *Weevil-plant.*
CURCUMA, L. †	Scitamin.	1736	from *kurkum*, its Arabic name.—N. *Turmeric.*
CUSCUTA, (Tourn). L.	Convol.	1735	after its Arabic name, *kechout* (Drury) ; derivation doubtful.—N. *Dodder.*
Cyamopsis, DC.	Leg. P.	1825	looking like a bean, from *cyamos* and *opsis*.—*Guvar.*
Cyanophyllum, Naud.	Melastom.	1852	from *kyanos*, blue, and *phyllon*, a leaf.
CYANOTIS, D. Don.*	Commel.	1825	from *kyanos*, blue, and *ous*, a ear ; the petals are blue.—N.
Cyanospermum, W. & A.	Leg. P.	1824	the seeds are dark blue ; *e.g.*, in C. *tomentosum*, Syn. *Rhyncosia cyanosperma.*
CYATHOCLINE, Cass.	Compo.	1829	from *cyathos*, a cup, and *cline*, a bed ; in allusion to the cup-like or concave receptacle.
CYATHULA, Lour.	Amarant.	1790	a diminutive of *cyathus*, a cup ; in allusion to the cup like structure formed by the united stamens.
Cycas, L.	Cycad.	1737	the Greek name of a palm said to grow in Æthiopia.—N.
Cyclamen, (Tourn.) L.	Primul.	1735	from *kyklos*, circular ; the peduncle is spirally twisted when young.—N. *Bleeding-nun.*
CYCLEA, Arn.	Meni.	1840	probably in allusion to the single orbicular petal in the female fl.
CYCLOSTEMON, Bl.	Euphor.	1825	the *stamens* form a *circle* outside the disk which is radiately ribbed.
Cydonia, (Tourn.)	Rosa.	1752	from Kydon in Crete.—N.
CYLISTA, Ait.	Leg. P.	1789	from *kylix*, the calyx ; the calyx encloses the corolla and is persistent and accrescent.
CYMBIDIUM, Sw. †	Orchid.	1799	the diminutive of *kymbe*, a boat ; the lip is boat-shaped.—N.
Cyminosma, Gärtn.	Ruta.	1788	*Cyminum*, and *osma*, a smell ; having the odour of Cummin.
CYNANCHUM, L.	Asclep.	1737	from *kynos*, a dog ; and *ancho*, to strangle ; alludes to the poisonous properties of the plants.—N.
Cynara, (Vaill.) L.	Compo.	1737	from *kyon*, a dog ; the involucre suggested a comparison with dog's teeth.—N.

* Don in Cooke.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Cynodon, Rich. in Pers. †*	Gram.	1805	from *kyons* and *odous*—the dog's teeth. *Hariáli*; *Bermuda grass*; *Doub grass*.
Cynoglossum, (Tourn.) L.	Boragin.	1735	from *kyon* and *glossa*; in allusion to the form of the leaves.—N; referring to the rough leaves of some species.—C.
Cynometra, L.	Leg. C.	1741	from *kyon* and *metra* (a matrix); in reference to the shape and consistence of the valves of the pod. —N.
Cyperus, (Mich.) L.†.	Cyper.	1735	a Greek name.—N.
Cyphomandra, Mart.	Solan.	1845	from *kyphoma*, a hump, and *aner*, a man; the anthers form a hump. —N.
Cypripedium, L.	Orchid.	1735	from *Kypris*, Venus, and *podion*, a slipper; the lip suggested the analogy.—N. *Lady's slipper*.
Cyrilla, L'Her.	Gesner.	1785	after Dominico Cyrillo, an Italian botanist; died, 1799.—N.
Cyrtanthera, Nees.	Acanth.	1847	from *kyrtos*, and *anthera*, meaning curved anthers.—N.
Cyrtanthus, Ait.	Amaryll.	1789	from *kyrtos* and *anthos*; the flowers are bent downwards.—N.
Cyrtodeira, Hanst.	Gesner.	1853	
Cyrtosperma, Griff.	Araceæ.	1851	*kyrtos*, curved, and *sperma*, a seed.
Cyrtostachys, Bl.	Palm.	1838	in allusion to the *curved spikes*.—N.
Dactylis, L.	Gram.	1742	from *daktulis*, a finger's breadth; apparently in allusion to the size of the clusters.—N; the head is also divided finger-like; cf. *Digitaria* below.
Dactyloctenium. Willd.	Gram.	1809	from *daktylos*, a finger, and *ktenion* a little comb; alluding to the digitate and pectinate spikes.—N.
Dædalacanthus, T. And. †	Acanth.	1864	meaning densely entangled spines; probably in allusion to the bracts which have very prominent nerves.
Dæmia, R. Br.	Asclep.	1809	from its Arabic name.—N.
Dæmonorops, Bl.	Palm.	1830	probably from *dæmon*, a deity, and *ops*, appearance; alluding to the beauty of the plant.—N.
Dahlia, Cav.	Compo.	1791	after Dr. Dahl, a Swedish botanist, and a pupil of Linnæus.—N.
Dalbergia, L. f. †	Leg. P.	1781	after Nicholas Dalberg, a Swedish botanist, 1730—1820.—N. *Blackwood-tree*.
Damasonium, Schreb.	Hydroch.	1789	meaning obscure.

* Pers. in Cooke.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Datura, L. †	Solan.	1735	from Sanskrit *dhastura*, a trumpet; the flowers are trumpet-shaped (Arabic *datora*—N.) *Thorn-apple.*
Daucus, (Tourn.) L.	Umbel.	1735	said to be from *dao*, to make hot; a medicinal term.—N. *Carrot.*
Debregeasia, Gaud.	Urti.	1844-66	derivation unknown; probably after a person.—B.
Decaneurum, DC.	Compo.	1833	from *deka*, ten, and *neuron*, nerves; in allusion to the ten ribs on the achenes.
Decaschistia, W. & A.	Malva.	1834	from *deka*, ten, and *schistos*, divided; in allusion to ten bracteoles and ten carpels.
Deguelia Aubl.	Leg. P.	1775	meaning peeled off?
Delima, L.	Dillen.	1747	from *deliom*, to shave off; the leaves are used to polish or shave off wood.—N.
Delphinium, (Tourn.) L. †	Ranun.	1735	from *delphinos*, a dolphin; so named on account of a resemblance of the flowers (the nectary) to the imaginary figures of the dolphin.—N.
Dendrobium, Sw. †	Orchid.	1799	from *dendron*, a tree, and *bios*, life; meaning an epiphyte.—N.
Dendrocalamus, Nees. †	Gram.	1834	from *dendron* and *calamus* (a reed); some of these bamboos reach fifty feet in height.
Dendrochilum, Bl.	Orchid.	1825	from *dendron* and *cheilos* (a lip); an epiphyte having lipped flowers.—N.
Dentella, Forst.	Rubia.	1776	in reference to the corolla lobes having a tooth on each side.
Derris, Lour.	Leg. P.	1790	from *derasus*, bare?
Desmanthus, Willd.	Leg. M.	1805	from *desme*, a bundle, and *anthos*, a flower; the flowers are in a bundle.—N.
Desmochæta, DC.	Amarant.	1813	from *desme* and *chæta* (a bristle); the perianth segments of the imperfect flowers are ultimately converted into stellately spreading hooked awns.
Desmodium, Desv.	Leg. P.	1813	from *desmos*, a band; in reference to the stamens being united. (The stamens are monodelphous in some of the species).—N. *Telegraph-plant.*
Deutzia, Thunb.	Saxifrag.	1784	after Johann Deutz, a Dutch naturalist, and patron of Thunberg.—N.
Dianella, Lam.	Lil.	1786	after Diana, the sylvan goddess—N.
Dianthera, Gronov.	Acanth.	1742	from *dis* and *anthera*; the anther cells are separated.—N.
Dianthus, L.	Caryo.	1735	from *dios*, divine, and *anthos*, a flower; in allusion to the beauty of the flowers.—N. *Pink.*

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Dicælospermum,* C. B. C.	Cucurbit.	1879..	the *seeds* are longitudinally ridged and slightly rugulose in the middle, containing three *cavities*, the central one enclosing the embryo, the *two* lateral empty.
Dicentra, Bernh.	Fumar.	1833 ..	meaning two spurred; the two outer petals are spurred.—N. cf. *Diplocentrum* below. *Seal-flower*.
Dicerma, DC.	... Leg. P.	1825 ..	
Dichæspermum, Wight.	Commel.	1853 ..	from *dicha*, in two or asunder, and *sperma*, a seed; the seeds are biseriate.
Dichopsis, Thw.	.. Sapot.	1864 ..	*dicha*, double, and *opsis*, resemblance. The lobes of the calyx are in two series and the anthers 2-lobed.
Dichorisandra, Mik.	.. Commel.	1820 ..	meaning *stamens* divided into *two* series.—B.
Dichrocephala, L'Hér.‡	Compo.	1833 ..	from *di*, two, *chroa*, colour, and *kephalos*, a head; the corollas of the ray and disk flowers are of different colours.
Dichrostachys, W. & A.‡	Leg. M.	1834 ..	in allusion to the spike bearing flowers of different colours at the top and at the bottom.
Dicliptera, Juss.	.. Acanth.	1807 ..	from *diklis*, double-doored, and *pteron*, a wing; refers to the capsule.—N.
Dicoma, Cass.	.. Compo.	1817 ..	meaning a double *coma*; pappus-hairs many seriate, the inner or all flat, barbellate, or feathery, the outer shorter, paleaceous or of slender bristles.
Dictyosperma, Wend. & Dr.	Palm.	1875 ..	from *diktyon*, a net, and *sperma*, a seed; in allusion to the raphe of the seed forming a loose network.—N.
Didymocarpus, Wall.	.. Gesner.	1819 ..	in the Bombay species the fruits are *not* didymous.
Dieffenbachia, Schott.	.. Araceæ.	1829 ..	after Dr. Dieffenbach, a German botanist.—N.
Digera, Forsk.	.. Amarant.	1775..	from Arabic *didjar*.
Digitalis, (Tourn.) L.	.. Scroph.	1735..	from *digitus*, a finger; after the shape of the corolla.—N. *Fox-glove*.
Digitaria, Heist.	.. Gram.	1763 ..	the inflorescence is usually digitate. Cf. *Dactylis* above.
Dilivaria, Juss.	.. Acanth.	1789 ..	inhabiting flooded places.
Dillenia, L. †	.. Dillen.	1735 ..	after John James Dillenius, professor of botany at Oxford.—N.

* There is a misprint of this name in Cooke.
‡ DC. in Cooke.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Dimeria, R. Br.	Gram.	1810	the spikelets are laterally much compressed, solitary, secund, *bifarious.*
Dimorphocalyx, Thw.	Euphor.	1861	calyx cup-shaped in the male flowers, and almost divided to the base in the female flowers.
Dimorphotheca, (Vaill.) L.	Compo.	1735	in allusion to the *receptacle* bearing florets of *two forms.*—N.
Dinebra, Jacq.	Gram.	1809	the native Arabic name.—Z.
Dioscorea, (Plum.) L.†	Dioscor.	1737	after the Greek physician P. Dioscorides of Cilicia who lived in the time of Nero.—N. *Yam.*
Diospyros, L. †	Eben.	1737	from *dios*, divine, and *Pyros*, Wheat; celestial food.—N. *Date-plum.*
Dipcadi, Medik.	Lil.	1790	derivation obscure.—N.
Dipetalum, Dalz.	Ruta.	1850	there are two petals.
Diplachne, P. B.	Gram.	1812	from *diplous*, double, and *achne* chaff.—Z. Fl. glume 2-4-toothed.
Diplocentrum, Lindl.	Orchid.	1832	from *diplos* and *kentron*, alluding to the two collateral spurs. Cf. *Dicentra* above.
Diplochonium, Fenzl.	Ficoid.	1839	the seeds are cohleate ; allusion ?
Diplospora, DC.	Rubia.	1830	the fruit is a two-celled few-seeded berry.
Dipteracanthus, Nees	Acanth.	1832	from *dis*, double, *pteron*, a wing, and *acanthus* spine ; application?
Dipterocarpus, Gärtn. f. *	Diptero.	1805	the *fruit* has *two wings*, derived from the sepals.
Dipterygium, Decne.	Cruci.**	1835	fruit compressed, surrounded by a wing on either side.
Discospermum, Dalz.	Rubia.	1850	seeds compressed ; Syn. *Diplospora.*
Disporum, Salisb.	Lil.	1812	from *dis* and *poros*, meaning twice porous ; allusion ?—N.
Dithyrocarpus, Kth.	Commel.	1741	meaning fruits with a double sheath; application ?
Dobera,‡ Juss.	Salvador.	1789	from its Arabic name.—Z.
Dodonæa, L. †	Sapind.	1737	after Dodonæus, a botanist.
Dolichandrone, Fenzl.	Bignon.	1862	having *long stamens.*
Dolichos, L. †	Leg. P.	1737	the *long* pods are referred to.—N. *Bean* and *Horse-gram.*
Dombeya, Cav.	Stercul.	1787	after Joseph Dombey, a French botanist of the eighteenth century.—N.
Dopatrium, Ham.	Scroph.	1835	the native Indian name.—Z.
Doratanthera, Benth.	Scroph.	1839	from *doratos*, a spear, and *anthera*, an anther ; "anthers versatile, curved with unequal segments."
Doronicum, (Tourn.) L.	Compo.	1735	from Arabic *doroniji.*—N.
Dorstenia, (Plum) L.	Urti.	1737	after Theodore Dorsten, a German botanist ; 1492—1552.—N.

* Gærtn. in Cooke, a misprint.
** Cappar in Cooke and in E & P.
‡ *Dobera*, Juss. is excluded by Cooke.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Dracæna, L. †	.. Lil.	1767	.. from *drakon*, a dragon.—N.
Dracontium, L.	.. Araceæ	1737	.. a diminutive of *drakon*, a dragon.
Dregea, E. Mey.	.. Asclep.	1837	.. after the German botanist Johann Franz Drege, 1794—1881, who travelled at the Cape in the interest of botany.—Z.
Drejera, Nees.	.. Acanth.	1847	..
Drosera, L.	.. Droser.	1735	.. from *droseros*, dewy; the secretion on the leaves looks like dew. *Sun-dew.*
Dumasia, DC.	.. Leg. P.	1825	.. after J. B. Dumas, a French naturalist of the nineteenth century.—C.
Dunbaria, W. & A.	.. Leg. P.	1824	.. dedicated to George Dunbar, 1744—1851, professor of Greek at Edinburgh.—Z.
Duranta, L.	.. Verben.	1737	.. after Castor Durantes, a botanist; died, 1590.—N.
Dypsis, Nor.	.. Palm.	1811	.. from *dupto*, to dip; application not given.—N.
Dyscoriste, Nees.	.. Acanth.	1832	.. meaning difficult to separate; probably alluding to its close alliance with other genera.—N.
Dysophylla, Bl.	.. Labiat.	1826	.. from *dysodes*, fetid, and *phyllon*, a leaf; they are not so in the Bombay species.
Dysoxylum, Bl.	.. Melia.	1825	.. from *dusodes*, fetid, and *xylon*, wood; application ?

(To be continued.)

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BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA, BURMA AND CEYLON.

Report No. 20.

By R. C. Wroughton.

Collection	... ...	No. 20.
Locality	... ...	Chindwin River.
Date	... ...	June—August, 1914.
Collected by	... ...	Mr. G. C. Shortridge and the late Capt. S. A. Macmillan.*

Earlier Reports . . . ... No. 1, East Khandesh, Vol. XXI, p. 392, 1912; No. 2, Berars, Vol. XXI, p. 820, 1912; No. 3, Cutch, Vol. XXI, p. 826, 1912; No. 4, Nimar, Vol. XXI, p. 944, 1912; No. 5, Dharwar, Vol. XXI, p. 1170, 1912; No. 6, Kanara, Vol. XXII, p. 29, 1913; No. 7, Central Provinces, Vol. XXII, p. 25, 1913; No. 8, Bellary, Vol. XXII, p. 58, 1913; No. 9, Mysore, Vol. XXII, p. 283, 1913; No. 10, Kathiawar, Vol. XXII, p. 464, 1913; No. 11, Coorg, Vol. XXII, 486, 1913; No. 12, Palanpur, Vol. XXII, p. 684, 1913; No. 13, South Ceylon, Vol. XXII, p. 700, 1913; No. 14, N. Shan States, Vol. XXII, p. 710, 1913; No. 15, Kumaon, Vol. XXIII, p. 282, 1914; No. 16, Dry Zone, Central Burma, and Mt. Popa, Vol. XXIII, p. 460, 1915; No. 17, Tenasserim, Vol. XXIII, p. 695, 1915; No. 18, Ceylon, Vol. XXIV, p. 79, 1915; No. 19, Bengal, Vol XXIV, p. 96, 1915.

This Collection represents the Fauna of the Valley of the Chindwin River, which runs North and South, more or less parallel to the course of the Irrawaddy, about 100 miles to the west of it. The following account of the Country is extracted from notes furnished by Mr. Shortridge:—

"The actual source of the Chindwin is as yet undetermined, but may be said to have its origin in the mountains that surround the Hukawng Valley at about 27° N. Latitude.

Little is known of the River during its passage through the Hukawng Valley, but at its Southern end, the course is interrupted by rapids (kyaukse). A short way below this it enters the small Shan State of Zinkaling Hkamti in the Upper Chindwin District.

From Hkamti the River flows nearly due South for 250 miles as the crow flies, to the point where it enters the Lower Chindwin District. Thence, after a further course of another 100 miles, in a more Easterly direction, it joins the Irrawaddy at Myingyan.

On the West bank of the Upper Chindwin, for long stretches, wooded hills slope down to the water's edge, and where the high

* Immediately on completion of the Collection both Collectors returned to Europe for War Service. Capt. Macmillan was severely wounded while leading his Company and died early in May. His death will be felt as a severe loss, not only by his personal friends but also by the Mammal Survey.

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ground falls back from the River the levels are often a mass of 'kaing' grass jungle. Population is sparse and villages few and far between. Unlike the West bank, the East, although often hilly, is nowhere mountainous. The main hill system that forms the watershed between the Chindwin and the Irrawaddy is at no place visible from the River.

On entering the Lower Chindwin District, the Valley widens out, the hills recede, and broad, level plains covered with crops, typical of the Dry Zone, begin to appear."

The actual length of the Chindwin, following the curves, "is about 600 miles, and is navigable for a considerable part of that distance during the rains. Steamers of the Irrawaddy Flotilla Company, as well as local Government launches, run the whole year round as high as Kindat and as far as Homalin when the river is in flood, at which time, although little communication is actually kept up, small stern-wheelers can get up stream almost to the rapids themselves."

"In the extreme North lie the mountains that surround the Hukawng Valley which appear to rise to about 6,000 or 7,000 feet. Separated from these by a considerable tract of the low country, in the North-west, bordering on the Zingkaling Hkamti State are the outlying mountains of the great pile of upland that separates the District from Assam. In this group is the highest peak in Burma, Sarameti (or Nwemauktaung) 12,557 feet, often capped with snow. From this main mass, branch a series of ridges, averaging from 2,000 to 3,000 feet, which run in a Southerly direction right down to the Southern border of the Lower Chindwin. These are separated from the Manipur and Chin Hills first by the Kabaw Valley and afterwards by that of the Myittha River. On the East, the comparatively low mountains which form the watershed between the Chindwin and the Irrawaddy are at no point close to the former, they consist of a range of abrupt hills averaging 1,000 feet, but rising to over 5,000 feet on the Katha boundary. In the Lower Chindwin the country becomes undulating, only slightly rising Eastwards to the low Nwegwedaung Range."

"The rocks belong to the Tertiary System. There is a coal bearing area in the West, and nummulithic limestone and shales further South; Eastward are miocene clays, and soft sandstones cover the greater part of the Lower Chindwin District.

In the Upper Chindwin there is rice cultivation in the valleys and a certain amount of 'Taungya' on the hill slopes; further South in the Lower Chindwin jowar, grass, beans, cotton and tobacco are grown.

In the Lower Chindwin the forests lie in the hills to the West, but further North, above Homalin, on the slopes of the mountains and on the river banks, the jungle becomes practically all evergreen,

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very dense, and full of fine timber, often mixed with many kinds of bamboos, which are cut, and rafted down the river in large quantities."

In the extreme South the rainfall is about 32 inches, rising gradually to 50 at Mingyin and to 92 at Homalin, "but Northwards around Sarameti and the Hukawng Valley it is probably as heavy as in Assam."

The following are descriptions of places at which collections were made:—

"*Zingkalling, Hkamti State.*—A Shan State lying to the South of the Hukawng Valley in the extreme North of the Chindwin District, extending on both sides of the River. The villages are nearly all on the banks of the river. The town of Hkamti is on the East bank near the extreme North of the State, about 140 miles above Homalin. The country round the Town is hilly but not mountainous, although the Sarameti group on the South, and the mountains that surround the Hukawng Valley on the North are not many miles distant. The forests are everywhere evergreen and very thick, and, except close to the Town, there is little cultivation. From this camp a short expedition was made to a Kachin Village on the West bank of the river about 20 miles North, where the river enters the Hukawng Valley.

Kauktaung.—A small village in Zingkaling Hkamti State, on the East bank of the river, about 40 miles south of Hkamti Town. evergreen jungle.

Minsin.—The second village of Hkamti State, on the East bank, within 20 miles of Sarameti mountain, which is further West. It is 60 miles South of Hkamti Town, hilly, evergreen jungle.

Tamanthe.—The most Northerly Military Police Station on the Upper Chindwin, on the West bank, about 60 miles above Homalin. Forest partly evergreen and partly mixed jungle, but more scrubby than further North. On the East bank the country is rather like that at Minsin, but the jungle is not entirely evergreen and not so dense, becoming mixed with bamboo inland. From here a short expedition was made to Hisweht, a small Naga village about five miles up the Tusu River, which flows from the West, into the Chindwin about a mile above Tamanthe.

Homalin.—On the East bank. The jungle here changes completely and appears to be a curious kind of rather open, not very high, deciduous jungle with stretches of 'kaing' grass. Country flat and swampy, cultivated areas round township. On the opposite bank the country is hilly and similar to Tamanthe.

Pyaunghyin.—On the East bank, about 60 miles South of Homalin. Much 'kaing' grass country.

Tatkon.—A village on the West bank about five miles above Kindat. To the West the country is hilly—a range of heavily

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wooded hills separating the River from the Kabaw Valley. The country along the river bank under cultivation, with thick mixed jungle inland.

Kindat.—The Headquarters of the Upper Chindwin District, situated on the East bank. The country is hilly and broken, the jungle thicker near the river than further inland.

Kin and *Yin.*—On opposite sides of the River, the former on the West bank, the latter on the East, about 56 miles above Monywa. The country is intermediate between that of the Wet and Dry Zones. On the West bank there is cultivation along the river with hill ranges beyond, covered with scrub jungle intermixed with larger trees. On the East the scrub jungle is thicker along the river, the country further inland being rather flat and much under cultivation.

Monywa.—About 50 miles from the junction of the Chindwin and Irrawaddy, on the East bank, it is the Headquarters of the Lower Chindwin District. The country is flat and typical of the Dry Zone.

The total specimens obtained by the Collectors amount to 851, but of these 12 are missing and 2 undeterminable. The balance 837, together with 35 specimens from this area, already recorded in other Reports, make a total 872, belonging to 76 named forms in 39 genera. A considerable number of these names are new but the outstanding interest of this collection is the question of variation and distribution which it raises. So far as I know, never has such ample material, representing the Fauna of a complete river basin been made available for study. The first point that emerges is that the Chindwin is an absolute obstacle to the extension Eastwards or Westwards of species of *Sciuridæ* belonging to its Western and Eastern banks respectively. In a recent paper in this Journal (p. 225) Mr. Thomas and myself have given a table showing the squirrel fauna of the two banks, and it will be noted that, with one exception, the species of the two sides are absolutely distinct. The one exception is *Tomentes lokroides*, and Mr. Shortridge states in his notes that this is quite an accident. He writes that *lokroides* is "very plentiful on the West bank from Kin to Hkamti. It is curious that a few specimens were obtained on the East bank at Homalin. The few obtained were shot immediately round the township and they were the only species obtained anywhere on the East bank of the Chindwin." The type locality of *lokroides* is Nepal, so that this species has ranged fully 8° Eastward, even crossing the Brahmaputra River, but here its further extension is stopped, and in the Lower Chindwin a quite well marked local race, *mearsi*, has been evolved.

Take again the species *Callosciurus sladeni*. It is confined to the country between the two rivers, Irrawaddy and Chindwin, unless further exploration shows it to have succeeded in crossing the

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Irrawaddy. The type locality of *sladeni* is Thizyain (? Tigyaing) on the Irrawaddy, just below Katha, where Capt. Kemmis also took it.

In this collection *sladeni* reappears unchanged on the East bank of the Chindwin at Kindat, in exactly the same latitude. It has, however, spread North and South along the River, forming local races which, though intergrading, are at certain points fairly constant. No less than six such are recorded in this Report. Besides these Mr. Thomas has described two other forms, *bartoni* and *midas*, the one from near Mansi on the Uyu River, the other from Myitkyina on the upper reaches of the Irrawaddy. Yet both these forms differ very much less from true *sladeni* than any of the Chindwin forms.

The type locality of *T. pygerythrus janetta* is Mandalay, and the Survey obtained it also at Mt. Popa. Thus the Lower Irrawaddy would seem to be a barrier to its extension Westwards but ceases to be so above the junction of the Chindwin.

Ratufa gigantea is an Assamese species and appears unchanged at the extreme North of the Chindwin, at Hkamti, where it is found on both banks. On the West bank it comes a short way South forming a local race *lutrina*, but on the East bank it was not found below Hkamti, although it is found but little if at all changed through the Shan States to Siam and beyond. (See Introduction to Mt. Popa Report.) *Ratufa fellii* belongs to the *melanopepla* group (which includes *phæopepla*), of which we have received specimens from Mt. Popa and Tenasserim, and which we know extends far South into Malaya. Here the *T. pygerythrus* distribution seems to be duplicated. We find no *Ratufa* on the East bank beyond Yin, and here *R. fellii* is closely related to *phæopepla marana*, the Burmese form of true Malay *melanopepla*. I do not pretend to draw any conclusions but have only written of the matter in such detail in the hope of interesting Members, and inducing them to carry the enquiry further. Let us hope that we shall be able later to obtain a collection "similar to this one" from the Upper Irrawaddy, but in the meanwhile much might be done by local residents.

Mr. Shortridge records his acknowledgment for assistance rendered to him as follows:—

"Not only on the Chindwin Expedition but throughout the whole time we have been working in the Province, Mr. B. S. Carey, C.S.I., C.I.E., the Commissioner of this Division, has been one of the chief helpers and mainstays of the Survey in Burma. Capt. R. W. Smart, Military Police, gave us a great deal of very much-needed help on the Upper Chindwin, and on the Lower Chindwin Capt. L. E. L. Burne, Deputy Commissioner, made every arrangement to ensure our success in his District.

Among others who helped in many ways are Mr. R. Wooster and every one we met belonging to the Irrawaddy Flotilla Company and the Bombay Burma Trading Corporation.

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Mr. G. W. Dawson, I.C.S., and Major F. C. Owens, the Deputy Commissioner of Sagaing, are among those who sent in valuable collections from districts we were unable to visit.

While we were in his State, the Saw Bwa of Zingkaling Hkamti gave us every assistance for which we are very grateful as we did not find the Upper Chindwin, the easiest and most satisfactory district in Burma to work in.

(1) HYLOBATES HOOLOCK, Harl.

The White-browed Gibbon.

(Synonymy in No. 14.)

♂1 Nasung Chang ; ♂1 Homalin ; ♂5, ♀2, Hkamti.

"Plentiful in the Upper Chindwin. Occurring on the West bank of the river from below Kindat Northwards. In Zingkaling, Hkamti State, it was equally plentiful on both sides of the river. It had evidently crossed over by way of the Hukawng Valley, above the source of the Chindwin, but the comparatively flat country south of that State, on the East bank, has not proved favourable for its extension further South. We found this species gregarious and quite similar in habits to *H. lar*. The call notes, however, although unmistakably recognisable as coming from a Gibbon, were quite different to those of *lar*. They are not nearly so musical, many of the sounds rather resembling the barking of a dog. As usual, the black and brown varieties were not sexual, in many old black males the hair on the chin and scrotum was white."—G.C.S.

(2) PITHECUS LEONINUS, Bl.

The Burmese Pig-tailed Monkey.

1863. *Inuus leoninus*, Blyth, Cat., p. 7.
1869. *Macacus andamanensis*, Bartlett, P.Z.S., p. 467.
1888. *Macacus leoninus*, Blanford, Mammalia No. 7.
♀1. Hkamti.

Very closely resembling the next species, but for the very peculiar arrangement of the hair on the crown of the head. There is no specimen in the National Collection with which to compare it, but the radiating arrangement of the hair on the crown and the horseshoe shaped crest are so characteristic that there can be no doubt of the identification. The type locality is Arakan.

"Obtained on the West bank of the river, in Hkamti State. Probably a hill form and possibly common enough round Sarameti and other hill regions."—G.C.S.

(3) PITHECUS ASSAMENSIS, Mc. Cl.

The Himalayan Monkey.

(Synonymy in No. 16.)

♂4, ♀5, Yin ; ♂2, ♀3, Tatkon ; ♂3, Homalin ; ♂2, ♀2, Hkamti ; ♂1, ♀1, Hisweht.

There does not seem to be any definite type locality for *P. rhesus*. The specimens in the National Collection of both *rhesus* and *assamensis* (except those contributed by the Mammal Survey) are of little assistance. The Mammal Survey has obtained one from Damoh, C. P., which certainly cannot be *assamensis*. It has the under parts, especially the throat, practically white (very pale greyish) and in this agrees with the specimens

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from Kumaon and Bengal-Orissa. On the other hand the Burmese specimens have the underside but little darker than the dorsal surface and always yellowish. On these grounds I ranked the Popa specimens (Report 16) as *assamensis* and do the same here. It is possible that our Assam Collection may provide further data. Mr. Shortridge thought these specimens to be *rhesus* and was naturally puzzled by the geographical distribution problem involved, because the specimens from the N. Shan States were recorded as *rhesus*.

(4) PRESBYTIS PHAYREI, Bl.

Phayre's Leaf Monkey.

(Synonymy in No. 14.)

♂2, ♀1, Kin.

(*See* also Report No. 16.)

A specimen No. 4210 collected by Mr. Dawson, I.C.S., at Yin, was recorded in the supplement to the Tenasserim Report. Mr. Shortridge writes that it was probably got on the West bank of the River.

"Fairly plentiful around Kin on the West bank of the Lower Chindwin, not observed on the East bank of the River, nor on the Upper Chindwin, where it is probably replaced on the West by *pileatus*, which appears to occur in the hills that run down from Manipur."—G.C.S.

(5) PRESBYTIS PILEATUS, Bl.

The Capped Monkey.

1843. *Semnopithecus pileatus*, Blyth, J.A.S.B., XII., p. 174.
1888. *Semnopithecus pileatus*, Blanford, Mammalia No. 20.
♂1, Nansun Chaung.

This animal is strongly characterised by its bright ginger yellow under parts and whiskers.

"Apparently the Langur occurring on the West bank of the Upper Chindwin. Probably more confined to the hills than the other species." —G.C.S.

(6) PRESBYTIS SHORTRIDGEI, Wr.

The Chindwin Langur.

1915. *Presbytis shortridgei*, Wroughton, Journ. B. N. H. S., XXIV, p. 56.
♂3, ♀2, Homalin; ♂1, Minsin.

A langur of the size and make of *pileatus*, of a clear blue grey colour with hands and feet and the major part of the tail black, as are the naked skin of the face, the moustache and eyebrows. The most characteristic feature is the hair on the crown which, as in *pileatus*, is laid straight back from the forehead, forming a 'cap', and not radiating from one or more points as in the langurs of the peninsula.

"This langur occurs on the East bank of the Chindwin, between Homalin and Hkamti, where it is plentiful. The face is entirely black with no trace of white areas around mouth and eyes. The white tufts on the ears are very conspicuous during life. Callosities bright orange brown. Iris rather light brown. Weight of large male 28—30 lbs."—G.C.S.

(7) PRESBYTIS SHORTRIDGEI BELLIGER, Wr.

The Khaki Chindwin Langur.

1915. *Presbytis shortridgei belliger*, Wroughton Journ. B. N. H. S., XXIV, p. 57.
♂5, Hkamti.

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In all respects like true *shortridgei*, but an olive brown is substituted for the clear blue grey of true *shortridgei*. Mr. Shortridge's note under *P. shortridgei* refers also to this form.

(8) CYNOPTERUS SPHINX SPHINX, Vahl.

The Southern Short-nosed Fruit Bat.

(Synonymy in No. 6.)

♂1, ♀23, Kin.
(*See* also Reports Nos. 9, 11, 13, 14, 15, 18 and 19.)

These specimens do not vary appreciably from those from South India, Ceylon, Kumaon, &c. Dr. Andersen records its presence as far East and South as Siam.

(9) RHINOLOPHUS AFFINIS, Horsf.

The Allied Horseshoe Bat.

1824. *Rhinolophus affinis*, Horsfield. Zool. Res. Jav., pl. 1.
1891. *Rhinolophos affinis*, Blanford, Mammalia No. 150.
♂1, Hisweht.

In the Ann. Mag. Nat. Hist. (XVI) for 1905, p. 649., Dr. Andersen records a number of local races of this species, of which the type locality is Java. Judging by locality only, this should be *macrurus* K. And. of the Karin Hills, but as Dr. Andersen is working at the group it is best to be satisfied for the present with the specific name.

"This Bat had a particularly strong smell."—G.C.S.

(10) RHINOLOPHUS MONTICOLA, K. And.

The Mussoorie Horseshoe Bat.

1891. *Rhinolophus petersi*, Blanford, Mammalia No. 152 (partim).
1905. *Rhinolophus monticola*, K. And., P. Z. S., p. 124.
in al. 1, Kindat.

(11) HIPPOSIDEROS ARMIGER, Hodgs.

The Great Himalayan Leaf-nosed Bat.

(Synonymy in No. 14.)

♂1, Kauktaung.
(*See* also Reports Nos. 15 and 16.)

"Observed around Kauktaung and Tamanthe. Flight slow and heavy. Its habit of circling round trees makes it at times rather easy to mistake for a small flying fox."—G.C.S.

(12) HIPPOSIDEROS LARVATUS, Horsf.

Horsfield's Leaf-nosed Bat.

(Synonymy in No. 14.)

♂23, ♀16, 1, in al. 26, Hkamti. A specimen collected at Yin by G.W. Dawson, I.C.S., was recorded in the Mt. Popa Report.

"Plentiful round Hkamti."—G.C.S.

(13) HIPPOSIDEROS FULVUS, Gray.

The Bi-coloured Leaf-nosed Bat.

(Synonymy in No. 3.)

1891. *Hipposideros bicolor*, Blanford, Mammalia No. 166 (partim).
♂1, Monywa; ♀2, Homalin.

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(14) MEGADERMA SPASMA TRIFOLIUM, Geoff.

The Malay Vampire Bat.

(Synonymy in No. 15.)

♀2, Kin; ♀2, Yin.

(*See* also Reports Nos. 6, 11, 13, 16, 17 and 18.)

(15) PIPISTRELLUS PATERCULUS, Thos.

The Burmese Pipistrel.

1915. *Pipistrellus paterculus*, Thomas, Journ. B. N. H. S., XXIV, p. 32.

♂1, ♀1, Tatkon; ♂1, ♀2, Homalin; ♂1, ♀1, Hkamti; ♀1 Tamanthe.

In his review of the Indian Pipistrels, on a recent page of this Journal (l. c.), Mr. Thomas included these specimens in his new species *P. paterculus*. All the specimens recorded in the Mt. Popa Report and the one recorded from Pyaunggaung, N. Shan States, in Report No. 14 also belong to this species. Outwardly there is little to distinguish this species from *P. coromandra*.

(16) PIPISTRELLUS MIMUS, Wr.

The Southern Dwarf Pipistrel.

(Synonymy in No. 1.)

♀1, Homalin.

(*See* also Reports Nos. 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 18 and 19.)

(17) TYLONYCTERIS MEYERI, Pet.

1872. *Tylonycteris meyeri*, Peters, MB. Akad, Berl. p. 705.

1891. *Vesperugo pachypus*, Blanford, Mammalia No. 180 (partim).

♂1, Tatkon; ♀2, Kindat.

(*See* also Reports Nos. 6, 11, 14 and 17.)

Mr. Thomas has kindly furnished me with the following note:—

"These specimens represent a small fulvous form of *Tylonycteris* which I am quite unable to separate from the Luzon *Tylonycteris meyeri*, Peters.

By the kind advice of Dr. N. Annandale, the Trustees of the Indian Museum, Calcutta, have been so good as to transfer to the British Museum two of its five co-types of "*Scotophilus fulvidus*," Blyth, from Schwegyin, which proves to be one of the medium species of the genus, of about the size of the Javan *T. pachypus*."

(18) SCOTOPHILUS KUHLI, Leach.

The Common Yellow Bat.

(Synonymy in No. 1.)

♂4, ♀4, Monywa; ♂4, ♀9, Kin; ♀2, Kindat; ♀1, Homalin; ♀1, Hkamti.

(*See* also Reports Nos. 3, 5, 6, 7, 9, 12, 14, 15, 16 and 19.)

(19) SCOTOPHILUS WROUGHTONI, Thomas.

A specimen from Sagaing was recorded in the Mt. Popa Report collected by Major F. C. Owens.

(20) TAPHOZOUS LONGIMANUS, Hardw.

The Long-armed Sheath-tailed Bat.

(Synonymy in No. 6.)

♂2, ♀5, Monywa; ♂2, ♀7, Kin; ♀1, Yin.

(*See* also Reports Nos. 7, 8, 9, 12, 16 and 19.)

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(21) TUPAIA BELANGERI SICCATA, Thos.

The Burmese Tree Shrew.

(Synonymy in No. 16.)

♂3, ♀4, Kin; ♂1, Yin; ♂2, ♀3, Tatkon; ♀1, Haingyan; ♀1, Tsibet.

(22) PACHYURA sp.

A specimen (no skull) collected by Major F. C. Owens in Sagaing was recorded in Report 16.

(23) FELIS AFFINIS, Gray.

The Jungle Cat.

(Synonymy in No. 1.)

1 (no skull), Lenakut. Two specimens collected at Tagyigin and Yin, Lower Chindwin, by G. W. Dawson, I.C.S., were recorded in the Supplement to the Tenasserim Report.

(*See* also Reports Nos. 3, 4, 5, 6, 7, 10, 11, 12, 15, 16, 18 and 19.)

(24) FELIS BENGALENSIS, Kerr.

The Leopard Cat.

(Synonymy in No. 11.)

♂1 1 (no skull), Haungyan; 1 (no skull) Pwepi.

(*See* also Reports Nos. 14, 15 and 16.)

(25) VIVERRA ZIBETHA, L.

The Large Indian Civet.

(Synonymy in No. 14.)

1, Yin (Collected by G. W. Dawson, I.C.S., and recorded in the Supplement to the Tenasserim Report (No. 17).

This specimen seems to be an intermediate between true *zibetha* and *pruinosa*, until the geographical distribution of these races is made clear by further material I prefer to leave it as *V. zibetha zibetha*.

(26) VIVERRA ZIBETHA PICTA, Wr.

The Large Painted Civet.

1915. *Viverra zibetha picta*, Wroughton, Journ. B. N. H. S., XXIV., p. 64. ♂1, ♀1, Hkamti.

This is a very brightly marked local race of *zibetha*.

(27) VIVERRA sp.

1, Nagpun near Kindat (no skull).

I am unable to give a name to this specimen. It very closely resembles one in the National Collection from Shensi, China.

(28) VIVERRA MEGASPILA, Blyth.

The Burmese Civet.

(Synonymy in No. 16.)

The specimen recorded in the Mt. Popa Report belongs here. It was collected by Major F. C. Owens in Sagaing.

1, Sagaing (Collected by Major F. C. Owens and recorded in the Mt. Popa report).

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(29) VIVERRICULA MALACCENSIS, Gmel.

The Small Indian Civet.

(Synonymy in No. 3.)

♀1, (juv), Kindat; A specimen collected by Major F. C. Owens in Sagaing was recorded in the Mt. Popa Report, and one from the Deputy Commissioner, Lower Chindwin.

(30) PARADOXURUS HERMAPHRODITUS, Pall.

The Malayan Palm Civet.

(Synonymy in No. 16.)

♀2, Kin; Four specimens from the Lower Chindwin, collected by G. W. Dawson, I.C.S., were included in the Mt. Popa Report (16) as also two skulls presented by Major F. C. Owens, while another specimen was recorded in the Supplement to the Tenasserim Report (17).

(31) CANIS INDICUS, Hodgs.

The Common Indian Jackal.

(Synonymy in No. 3.)

♀2, Yin; ♂1, collected by G. W. Dawson, I.C.S., was recorded in the Supplement to the Tenasserim Report (17).
(*See* also Reports Nos. 1, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15, 16, 18 and 19.)

(32) MARTES FLAVIGULA, Bodd.

The Northern Indian Marten.

(Synonymy in No. 15.)

3 (2 skulls), Haingyan; ♂1, Homalin.
"Martens are apparently plentiful among the hills on the West bank of the Chindwin. It seems exceptional to get a specimen at Homalin, on the East bank, where the country is flat and swampy."—G.C.S.

(33) HELICTIS PERSONATA, Is. Geoff.

The Burmese Ferret Badger.

(Synonymy in No. 16.)

A skull collected by G. W. Dawson, I.C.S., in Sagaing was recorded in the Mt. Popa Report.

(34) AONYX CINEREA, Ill.

The Clawless Otter.

(Synonymy in No. 11.)

3 (no skulls), Kindat. A specimen collected by J. E. Hopwood, I.F.S., on the Upper Chindwin was recorded in the Supplement to Report No. 16. Mt. Popa.

(35) LUTRA MACRODUS, Gray.

The Smooth Indian Otter.

(Synonymy in No. 7.)

1 (cured skin, no skull), Kindat. A specimen without skull collected by Major F. C. Owens at Sagaing was recorded in Report 16. Mt. Popa.

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The three species of Indian Otter are easily distinguished. *Aonyx* by its clawless forefeet: and the two species of *Lutra* between themselves by the line of demarcation where the hair of the face ceases at the tip of the nose. In *Lutra macrodus* it is a straight line, but in *L. lutra* there is a triangular indentation in the centre of the line.

(36) URSUS MALAYANUS.

The Malay Bear.

(Synonymy in No. 14.)

1 (no skull) near Kindat; collected by G. K. Parker. I. F. S.

(37) PETAURISTA CANDIDULUS, Wr.

The Chindwin Flying Squirrel.

1875. *Pteromys yunnanensis*, Blanford, Mammalia No. 230 (partim).
1911. *Petaurista candidulus*, Wroughton, Journ. B.N.H.S., XX., p. 1014.
♂3, ♀1, Kin; ♂1 juv. Yebwa; 1, Paga, Neni. The last was collected by G. W. Dawson, I.C.S., and recorded (17) Tenasserim Supplement.

Somewhat resembling *yunnanensis*, a large Flying Squirrel of a general red colour, but so washed with white (in *candidulus*) as almost to obscure the ground colour.

(38) PTEROMYS ALBONIGER, Hodgs.

The Particoloured Flying Squirrel.

1836. *Sciuropterus alboniger*, Hodgson, J. A. S. B., V., p. 231.
1891. *Sciuropterus alboniger*, Blanford, Mammalia No. 234.
♂1, 2, Haingyaw.

(39) PTEROMYS PHAYREI PROBUS, Thos.

Blyth's Flying Squirrel.

(Synonymy in No. 16.)

1, Haingyaw.

(40) BELOMYS TRICHOTIS, Thos.

1908. *Belomys trichotis*, Thomas, A.M.N.H. (8), I., p. 7.
♂1, 1, Yin; ♀1, 40 miles W. of Kalewa.
The specimen collected by G. W. Dawson, I.C.S., at Yin and recorded in the Mt. Popa Report is no doubt this species.

(41) RATUFA GIGANTEA, McCl.

The Assam Giant Squirrel.

(Synonymy in No. 14.)

♂2, ♀5, Hkamti; ♂1, Maunghan; 1, Haingyaw.
"Appearing on the East bank from Maunghan northwards."—G.C.S.

(42) RATUFA GIGANTEA LUTRINA, Thos. & Wr.

The Pale Assam Giant Squirrel.

1915. *Ratufa gigantea lutrina*, Thomas and Wroughton, Journ. B.N.H.S., XXIV., p. 226.
♂1 Nasung Chaung; ♂2, ♀2, Tatkon; 1, Nanthalet; 1, Sadwin; 1, Ahlaw; 1, Awin Chaung.
"Occurring on the West bank of the Chindwin from Kindat northwards."—G.C.S.

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(43) RATUFA FELLII, Thos. & Wr.

Fell's Giant Squirrel.

1916. *Ratufa fellii*, Thomas and Wroughton, Journ. B.N.H.S., XXIV., p. 226.

♂ 7, ♀ 13, Yin. 1 specimen (4212) collected at Yin by G. W. Dawson, I.C.S., and recorded in Report No. 16.

This is a local race of *melanopepla*, perhaps most easily distinguished from *Gigantea* by the fact that the yellow colouring of the fore limbs appears also as a band across the front of the forearm.

"Apparently a very local race, occurring on the East bank of the Lower Chindwin, around Yin village, where it is very plentiful, in low deciduous forest."—G. C. S.

(44) CALLOSCIURUS ERYTHRÆUS NAGARUM, Thos. & Wr.

The Naga Squirrel.

1891. *Sciurus erythræus*, Blanford, Mammalia No. 245 (partim).

1916. *Callosciurus erythræus nagarum*, Thomas and Wroughton, Journ. B.N.H.S., XXIV., p. 223.

♂ 1, ♀ 1, Haingyan; ♂ 1, Nankank; ♂ 2, Homalin; ♂ 1, ♀ 5, Tamanthe.

Mr. Thomas has recently (A.M.N.H. (8), XV., p. 383, 1915) pointed out that, judging by the form of the "baculum," the generic name *Sciurus* must be restricted, and disappears entirely from the fauna of India. I adopt here the generic names substituted by him (l. c.)

This is probably the Manipur form. The type locality is Sadiya, Assam. The general colouring is an olive grey and buff grizzle above and red below. The tail is also grizzled at the base but the terminal half is jet black. It differs from the following races by its sombre coloration. All these forms of *erythræus* are found only on the West bank of the River, the present one about the middle at Homalin and Tamanthe.

(45) CALLOSCIURUS ERYTHRÆUS CROTALIUS, Thos. & Wr.

The North Chindwin Squirrel.

1891. *Sciurus erythræus*, Blanford, Mammalia No. 245 (partim).

1916. *Callosciurus erythræus crotalius*, Thomas and Wroughton, Journ. B.N.H.S., XXIV., p. 229.

♂ 1, 20 miles N. of Hkamti; ♂ 18, ♀ 20.

Characterised by its pale tail-tip. It is found only at the extreme north end of the River about Hkamti.

(46) CALLOSCIURUS ERYTHRÆUS KINNEARI, Thos. & Wr.

Kinnear's Squirrel.

1891. *Sciurus erythræus*, Blanford, Mammalia No. 245 (partim).

1916. *Callosciurus erythræus kinneari*, Thomas and Wroughton, Journ. B.N.H.S., XXIV., p. 229.

♂ 8, ♀ 8, Tatkon; ♂ 1, ♀ 1, Ahlaw and Nanthalet.

Easily recognisable by its white tail with dark tip. Belongs to the Lower Chindwin about Tatkon.

(47) CALLOSCIURUS SLADENI SLADENI, Anders.

Sladen's Squirrel.

1871. *Sciurus sladeni*, Anderson, P.Z.S. p. 139.

1891. *Sciurus erythræus*, Blanford, Mammalia No. 245 (partim).

1908. *Sciurus kemmisi*, Wroughton, A.M.N.H. (8), II.

♀ 1, Tatkon (East bank); ♂ 19, ♀ 20, Kindat.

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This species, with its races, was found only on the East bank of the River, whence it is known to extend at least to the West bank of the Irrawaddy. The type locality of *sladeni* is "Thygyain, Upper Burma," while that of *kemmisi* is Katha. Mr. Shortridge found his specimens at Kindat on the Chindwin which is due west of the type locality. Whether the other races similarly extend across to the Irrawaddy or are there replaced by other forms, and whether any of them (or other forms of *sladeni*) extend beyond the Irrawaddy to the East we cannot say on the material available. Typical *sladeni* is grizzled olive grey above, deep ochraceous below, the full mask, feet and terminal portion of tail ferruginous.

(48) CALLOSCIURUS SLADENI SHORTRIDGEI, Thos. & Wr.

Shortridge's Squirrel.

1891. *Sciurus erythræus*, Blanford, Mammalia, No. 245 (partim).
1916. *Callosciurus sladeni shortridgei*, Thomas and Wroughton, Journ. B.N.H.S., XXIV., p. 232.
♂14, ♀29, Hkamti.

Above grizzled cinnamon brown, below and feet ochraceous. Tail like the body but more coarsely grizzled with ferruginous tip. Pale mask almost or quite absent.

(49) CALLOSCIURUS SLADENI FRYANUS, Thos. & Wr.

Fry's Squirrel.

1891. *Sciurus erythræus*, Blanford, Mammalia No. 245 (partim).
1916. *Callosciurus sladeni fryanus*, Thomas and Wroughton, Journ. B.N.H.S., XXIV., p. 232.
⚥3, Kaungtaung; ♂3, ♀5, Minsin.

General colour above more buffy, mask and feet pale buff, below and tail tip pale ochraceous.

(50) CALLOSCIURUS SLADENI CAREYI, Thos. & Wr.

Carey's Squirrel.

1891. *Sciurus erythræus*, Blanford, Mammalia No. 245 (partim).
1916. *Callosciurus sladeni careyi*, Thomas and Wroughton, Journ. B.N.H.S., XXIV., p. 233.
♀7, Tamanthe.

General colour ochraceous, without grizzling, above, buff below, mask and feet paler buff, almost whole tail ochraceous like the back.

(51) CALLOSCIURUS SLADENI HARINGTONI, Thos.

Harington's Squirrel.

1891. *Sciurus erythræus*, Blanford, Mammalia No. 245 (partim).
1905. *Sciurus haringtoni*, Thomas, A.M.N.H. (7), XVI., p. 314.
1914. *Sciurus haringtoni solutus*, Thomas, Journ. B.N.H.S., XXIII., p. 179.
♂23, ♀17, Homalin; ♂3, ♀4, Maungkan.

General colour above nearly white, without grizzling, below ochraceous buff, mask and feet buff, tail buffy white, no annulations on the hairs.

(52) CALLOSCIURUS SLADENI MILLARDI, Thos. & Wr.

Millard's Squirrel.

1891. *Sciurus erythræus*, Blanford, Mammalia No. 245 (partim).
1916. *Callosciurus sladeni millardi*, Thomas and Wroughton, Journ. B.N.H.S., XXIV., p. 233.
♂6, ♀1, Paungbyin.

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General colour above dark grizzled grey, below bright buff, mask and feet creamy white, tail one-fourth like the back, remainder ochraceous buff.

(53) CALLOSCIURUS SLADENI RUBEX, Thos.

The Ruddy Squirrel.

1891. *Sciurus erythræus*, Blanford, Mammalia No. 245 (partim).
1915. *Callosciurus sladeni rubex*, Thomas, XXIII., p. 198.
♂12, ♀11, Yin.

(54) TOMEUTES PYGERYTHRUS JANETTA, Thos.

The Irrawaddy Squirrel.

(Synonymy in No. 16.)

♂10, ♀5, Yin; ♂1, ♀1, Monyw. Two specimens collected by G. W. Dawson, I.C.S., at Yin, were recorded in the Mt. Popa Report.
East bank.

(55) TOMEUTES LOKROIDES LOKROIDES, Hodgs.

The Hoary-bellied Himalayan squirrel.

1836. *Sciurus lokroides*, Hodgson, J.A.S.B., V., p. 232.
1891. *Sciurus locroides*, Blanford, Mammalia No. 251.
♂21, ♀16, Tatkon; ♂1, ♀4, Homalin; ♂2, ♀3, Tamanthe; ♂1, ♀4, Hkamti.
West bank.

(56) TOMEUTES LOKROIDES MEARSI, Bonh.

Mear's Squirrel.

1891. *Sciurus locroides*, Blanford, Mammalia No. 251 (partim).
1906. *Sciurus lokroides mearsi*, Bonhote, A.M.N.H. (7), XVIII., p. 337.
♂22, ♀15, Kin.
West bank.

(57) TOMEUTES SIMILIS OWENSI, Thos. & Wr.

Owen's Squirrel.

1891. *Sciurus locroides*, Blanford, Mammalia No. 251 (partim).
1867. *Macroxus similis*, Gray, A.M.N.H. (3), XX., p. 281 (partim).
1916. *Tomeutes similis owensi*, Thomas and Wroughton, Journ. B.N.H.S., XXIV., p. 236.
♀1, Kaungtaung; ♂3, ♀1, Hkamti; ♂1, Minsin.
East bank.

(58) TOMEUTES STEVENSI, Thos.

Steven's Squirrel.

1908. *Sciurus stevensi*, Thomas, Journ. B.N.H.S., XVIII., p. 246.
♀1, 20 miles N. of Hkamti.

The type locality of the species is Sadiya in Upper Assam. The general colour above is red brown, with a faint suspicion of grizzling, below blue grey. This grey abdomen is in marked contrast with the white, buff and ochraceous of all the other squirrels in these parts.
West bank.

(59) DREMOMYS LOKRIAH, Hodgs.

The Orange-bellied Himalayan Squirrel.

1836. *Sciurus lokriah*, Hodgson, J.A.S.B., V., p. 232.
1891. *Sciurus locria*, Blanford, Mammalia No. 243.
1 juv. (no skull) Tsebet; ♀1 juv. (no skull) Haingyan.

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I assign these specimens to the Nepalese *lokriah* with considerable hesitation. Both these localities are in the Chin Hills and it would be interesting to find *D. lokriah* unchanged so far from home.

(60) DREMOMYS RUFIGENIS ADAMSONI, Thos.

Adamson's Squirrel.

(Synonymy in No. 16 Supp.)

♂6, ♀2, Kindat.

These specimens seem quite like those from the Shan States.
East bank.

(61) DREMOMYS RUFIGENIS OPIMUS, Thos. & Wr.

The Northern Red Cheeked Squirrel.

1891. *Sciurus rufigenis*, Blanford, Mammalia No. 244 (partim).
1916. *Dremomys rufigenis opimus*, Thomas and Wroughton, Journ. B.N.H.S., XXIV., p. 237.
♂2, ♀3, Hkamti.

This northern race is somewhat larger than *adamsoni*, and in all respects more brightly coloured, this being especially noticeable in the hip patches.
East bank.

(62) DREMOMYS MACMILLANI, Thos. & Wr.

Macmillan's Squirrel.

1916. *Dremomys macmillani*, Thomas and Wroughton, Journ. B.N.H.S., XXIV., p. 238.
♂1, Tatkon; ♀1, Tsebit; ♂1, Letsyaw.

Most closely related to *lokriah* but easily distinguished by the median dorsal stripe which marks it out from all other forms in the genus.
West bank.

(63) TAMIOPS MACCLELLANDI, Horsf.

The Striped Himalayan Squirrel.

1839. *Sciurus macclellandi*, Horsfield, P.Z.S., p. 152.
1891. *Sciurus macclellandi*, Blanford, Mammalia No. 257.
♂9, ♀3, Hkamti; ♂1, ♀2, Tamanthe; ♀1, Maungkan.

Tamiops macclellandi is a small squirrel with a grizzled greenish brown ground colour. Down the centre of the back is a narrow black line, on each side of this the ground colour is paler and then darker than the average thus forming a pale and dark stripe parallel to the median line, on the outside are two pale buffy lines. In *T. m. manipurensis* the contrast between the pale and dark area alongside the median line is much greater. While in *T. m. barbei* from Tenasserim the edges of these two lines, hitherto somewhat undefined, become sharply defined and the outer one is black.

(64) TAMIOPS MACCLELLANDI MANIPURENSIS, Bonh.

The Manipur Striped Squirrel.

1891. *Sciurus macclellandi*, Blanford, Mammalia No. 257.
1899. *Sciurus macclellandi manipurensis*, Bonhote, A.M.N.H. (7) IV., p. 51.
♀2 Haingyan, Chin Hills; ♂1, Pwepi, Chin Hills.

(65) MUS MANEI, Kel.

The Common Indian House Mouse.

(Synonymy in No. 5.)

♂2, ♀2, Monywa.

(*See* also Reports Nos. 1, 3, 5, 6, 8, 9, 10, 11, 12. 13, 14, 16, 18 and 19.)
"The House Mouse was not obtained on the Upper Chindwin."—G.C.S.

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(66) MUS BOODUGA, Gray.

The Southern Field Mouse.

(Synonymy in No. 1.)

♀1. Yin ; ♂3, Kin ; ♂1, Tatkon ; ♀1, Hkamti.

1 collected by Maj. F. C. Owens at Ngazum, recorded in Mt. Popa Report.

(*See* also all previous Reports except Nos. 3, 14 and 17.)

"West bank of Lower Chindwin, not plentiful."—G.C.S.

(67) MUS COOKII, Ryl.

The Burmese Field Mouse.

(Synonymy in No. 14.)

♂2, ♀1, Madaw ; East Manipur.

(68) EPIMYS CONCOLOR, Blyth.

The Little Burmese Rat.

(Synonymy in No. 16.)

♀1, Monywa ; ♂7, ♀7, Kin ; ♂ 1, Kindat ; ♂1, Shabin ; ♂2, Tatkon ; ♀4, Homalin ; ♂16, ♀15, Hkamti ; ♂2, ♀4, Tamanthe ; ♂4, ♀2, Hisweht.

Five specimens collected at Yin by G. W. Dawson, I.C.S.

(*See* also Report No. 17.)

"Very plentiful on both banks of the Chindwin to as far north as Hkamti."—G.C.S.

(69) EPIMYS RUFESCENS.

The Common Indian Rat.

Variety with white underparts.

♂2, ♀2, Kin ; ♂1, Kadu Chaug ; ♂2, Tatkon ; ♂1, Paungbyin ; ♂4, ♀4, Hkamti ; ♀1, Tamanthe ; ♀2, Hisweht.

(70) EPIMYS JERDONI, Blyth.

The Bicoloured Rat.

(Synonymy in No. 14.)

♂23, ♀18, Hkamti.

These specimens are certainly not identical with those labelled *jerdoni* from the Shan States and Tenasserim. The type of *jerdoni* is stated to have been taken by Dr. Jerdon in Sikhim. The Indian Museum claims to have the type from Darjeeling, it is evidently a quite young animal. Until we have our Sikhim Collection I prefer to leave these specimens as *jerdoni* to which at any rate they seem to be closely related.

"Plentiful in evergreen jungle around Hkamti. Occurring on both banks of the River, but apparently much more plentiful on the East bank."—G.C.S.

(71) EPIMYS BERDMOREI, Blyth.

The Grey Rat.

1851. *Mus berdmorei*, Blyth, J. A. S. B., XX., p. 173.
1891. *Mus berdmorei*, Blanford, Mammalia No. 277.

♂2, Yuyu River, Hkamti ; 1 (no skull) from Chin Hills collected by Capt. Massey (4667) and recorded as *indeterminable in Supplement to Tenasserim Report.*

This is a handsome, rather long haired pure grey rat, with white underparts.

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(72) EPIMYS BOWERSI, And.

Anderson's Rat.

(Synonymy in No. 3, Vol. xxiii.)

♂ 2, Kindat, collected by S. F. Hopwood, I. F. S., and recorded in Supplement to Mt. Popa Report.

(73) GUNOMYS BENGALENSIS, Gray and Hardw.

The Bengal Mole Rat.

(Synonymy in No. 19.)

♂ 1, ♀ 1 Tatkon.

Both specimens are young, but I think there is no doubt but that they are *bengalensis*.

(74) ACANTHION BRACHYURUS, L.

The Malay Porcupine.

(Synonymy in No. 16.)

Two specimens (4230, 4231) collected at Sagaing by Major F. C. Owens and recorded in the Mt. Popa Report.

(75) CANNOMYS BADIUS, Hodgs.

The Bay Bamboo Rat.

1842. *Rhizomys badius*, Hodgson, Calc. Journ. N. H., II., p. 60.
1881. *Rhizomys badius*, Blanford, Mammalia No. 312.

♂ 1, Kadu Chang; ♀ 2, Kadu; 1, Maungkan.

I use this name *badius* for the present, pending the result of an examination of this group on which Mr. Thomas is engaged.* The generic name used is that created by him for all the small forms of *Rhizomys*.

(76) LEPUS PEGUENSIS, Blyth.

The Pegu Hare.

(Synonymy in No. 16.)

♀ 1, Kin; 1 from Ngazun, Sagaing, collected by Major Owens, and 2 from Lower Chindwin collected by G. W. Dawson, I.C.S.; all three recorded in the Mt. Popa Report.

(77) MUNTIACUS VAGINALIS, Bodd.

The Bengal Rib-faced Deer.

♂ 1, Hkamti; ♀ 1, Tamanthe.

In Report No. 2 a synonymy was given but the further material since obtained has rendered possible a sorting out of the forms of the Indian Muntjac. The type locality of *vaginalis* is 'Bengal' and we still have no topotype to guide us, but as Hodgson's *ratwa* from Nepaul and the present specimens are sufficiently alike I have presumed that both represent *vaginalis*. The colour contrast between *vaginalis* and the Dekhan *aureus* on the one side and the Burmese *grandicornis* on the other is very marked, both the latter are quite pale coloured while *vaginalis* is a dark brown.

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* This paper was published in the Ann. and Mag. Natural History (8) xvi., p. 313, Oct. 1915, and the small Chindwin Bamboo Rats are named as above—Eds.

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(78) MUNTIACUS GRANDICORNIS, Lyd.

The Burmese Rib-faced Deer.

(Synonymy in No. 17.)

♂ 2, ♀ 1, Kin; ♂ 1, Yin.

(79) CERVUS PORCINUS, Zimm.

The Hog Deer.

1777. *Cervus porcinus*, Zimmermann. Spec. Zool. Geog. Quad. p. 532.
1891. *Cervus porcinus*, Blanford, Mammalia No. 369.
♂ 1, juv. Homalin.

"Apparently plentiful in 'kaing' grass country between Homalin and Kindat."—G.C.S.

(78) (?) SUS CRISTATUS, Wagn.

The Indian Wild Boar.

(Synonymy in No. 5.)

Skull of a young animal collected in Sagaing by Major F. C. Owens and recorded in Mt. Popa Report.

SUS sp.

A skull collected by Deputy Commissioner, Lower Chindwin and recorded in Supplement to Tenasserim Report.

REPORT No. 21.

BY R. C. WROUGHTON.

COLLECTION	... ...	No. 21.
LOCALITY	... ...	Gwalior.
DATE	... ...	July-August, 1914.
COLLECTED BY	... ...	Major E. W. Mayor.
EARLIER REPORTS	...	*See* No. 20 on page 291.

This small Collection is a commencement of one intended to represent the fauna of the Gwalior State in Central India. Only two camps had been made when Major Mayor had to return to Europe, to take part in the War.

It comprises 75 specimens of 10 species. There is nothing new, and but little of special interest. With a fragmentary collection such as this no conclusions can be drawn from the absence of any species. It may however be noted that *Mungos mungo mungo* and *Lepus ruficaudatus* are both typically "Bengal" forms.

(1) RHINOPOMA HARDWICKEI, Gray.

The Lesser Indian Mouse-tailed Bat.

(Synonymy in No. 3.)

♂ 3, ♀ 4, in al. 9, Ghatigaum.

(*See* also Reports Nos. 5, 7 8, 10, 12 and 19.)

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(2) MUNGOS MUNGO MUNGO, Gmel.

The Common Bengal Mungoose.

♂ 2, ♀ 1, Ghatigaum.

(*See* also Report No. 19.)

(3) MUNGOS AUROPUNCTATUS, Hodgs.

The Lesser Indian Mungoose.

(Synonymy in No. 19.)

♂ 1, Ghatigaum; ♂ 1, ♀ 3, Chorepura.

(4) CANIS INDICUS, Hodgs.

The Indian Jackal.

(Synonymy in No. 3.)

♀ 1, Ghatigaum.

(*See* also Reports Nos. 1, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15, 16, 18, 19 and 20.)

(5) FUNAMBULUS PENNANTI, Wr.

The Common Five-striped Squirrel.

(Synonymy in No. 1.)

♂ 11, ♀ 4, in al. 2, Ghatigaum; ♂ 4, ♀ 1, in al. 1, Chorepura.

(*See* also Reports Nos. 2, 3, 4, 5, 7, 12, 15 and 19.)

(6) TATERA INDICA, Hardw.

The Indian Gerbil.

(Synonymy in No. 1.)

♀ 1, Chorepura.

(*See* also Reports Nos. 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15 and 19.)

(7) MUS BOODUGA, Gray.

The Southern Field Mouse.

(Synonymy in No. 1.)

In al. 2, Chorepura.

(*See* also all previous Reports except Nos. 3, 14 and 17.)

(8) EPIMYS RUFESCENS, Gray.

The Common Indian Rat.

(Synonymy in No. 1.)

♂ 1, ♀ 1, 2, Ghatigaum; ♂ 3, ♀ 2, 1, Chorepura.

(*See* also Reports Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15 and 18.)

(9) LEPUS RUFICAUDATUS, Geoff.

The Common Bengal Hare.

(Synonymy in No. 15.)

♂ 1, ♀ 2, Chorepura.

(*See* also Report No. 19.)

(10) GAZELLA BENNETTII, Sykes.

The Indian Gazelle.

(Synonymy in No. 1.)

♂ 1, ♀ 2, in al. 1, Ghatigaum; ♂ 2, ♀ 1, Chorepura.

(*See* also Reports Nos. 3, 7 and 10.)

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REPORT No. 22.

BY R. C. WROUGHTON.

COLLECTION	... ...	No. 22.
LOCALITY	... ...	Koyna Valley.
DATE	... ...	December, 1914—January, 1915.
COLLECTED BY	... ...	Mr. S. H. Prater.
EARLIER REPORTS...	...	*See* No. 20 on page 291.

The valley of the Koyna River runs North and South, parallel to the crest of the Western Ghats, and a short distance East of it, for a distance of about 40 miles, when the river turns sharply East. It was this first stretch of 40 miles whose fauna it was intended to investigate, but unfortunately the original intention could not be carried out. Mr. Prater, however, made a collection at Medha at the north end of the valley, at the foot of Mahableshwar, and another at the bend, at Helwak, and supplemented these by a couple of collections at and near Shirgaum and Khed, in the Ratnagiri District, below ghats. The collection thus represents the fauna immediately above (2,000 feet) and below (but slightly above sea level) the Western Ghats, at between 17-18 degrees North.

The Collection contains 420 specimens belonging to 34 species. It is interesting on account of the data of distribution, *e. g.*, in the case of *Mungos mungo ellioti*, and *Funambulus pennanti*, &c., which it furnishes, but that is all that can be claimed for it.

The following are Mr. Prater's notes on the collecting Stations :—

Karad in the Krishna Valley, where the Koyna river joins the Krishna. The country is flat gradually sloping towards the hills on either side, there are no forests but many gardens and plantations.

Helwak in the Koyna Valley. The Koyna river here flows between high hills, covered with dense jungle except where the hill side have not been cleared.

Ghatmatha situated as its name implies at the head of the ghat from where the road descends into the Konkan.

Shirgaum on the borders of the Ratnagiri district at the foot of the ghats. The surrounding country is all under cultivation.

Khed a small town on the tidal creek which opens out on to the coast at Dhabul. The country is undulating and surrounded by low bare hills.

(1) PITHECUS SINICUS, L.

The Bonnet Monkey.

(Synonymy in No. 5.)

♂ 1, Ghatmatha, Satara.

(*See* also Reports Nos. 5, 6, 8, 9 and 11.)

Hitherto the Survey has only recorded this animal from Dharwar and southwards.

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(2) PRESBYTIS ENTELLUS ANCHISES, Blyth.

The Southern Langur.

(Synonymy in No. 11.)

♂ 1, Helwak, Satara.

(*See* also Report No. 11.)

Hitherto only obtained by the Survey from Coorg.

(3) PTEROPUS GIGANTEUS, Bruenn.

The Common Flying Fox.

(Synonymy in No. 2.)

♂ 2, ♀ 2, Patan, Ratnagiri.

(*See* also Report Nos. 2, 3, 4, 5, 7, 8, 9, 10, 12, 13, 15, 18 and 19.)

(4) ROUSETTUS LESCHENAULTI. Desm.

The Fulvous Fruit Bat.

(Synonymy in No. 11.)

♂ 9, ♀ 15, al. 24, Ghatmatha, Satara.

"I caught these bats in a large cave. They resemble *Pteropus giganteus* in their perpetual squabbling and shrieking and changing of places which seems to go on at all times."—S.H.P.

(*See* also Reports Nos. 15, 16, and 17.)

(5) RHINOLOPHUS LEPIDUS Blyth.

The Little Indian Horse-shoe Bat.

(Synonymy in No. 6.)

♂ 1, Helwak, Satara.

(*See* also Reports Nos. 6, 7, 15, 16 and 19.)

(6) HIPPOSIDEROS FULVUS, Gray.

The Bicoloured Leaf-nosed Bat.

(Synonymy in No. 3.)

♂ 5, ♀ 7, in al. 2, Shirgaum, Ratnagiri.

(*See* also Reports Nos. 5, 6, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18 and 19.)

(7) LYRODERMA LYRA, Geoff.

The Indian Vampire Bat.

(Synonymy in No. 1.)

♂ 14, ♀ 10, in al. 20, Khed, Ratnagiri.

(*See* also Reports Nos. 1, 4, 5, 6, 7, 8, 9, 12, 14, 15 and 19.)

(8) PIPISTRELLUS CEYLONICUS CHRYSOTHRIX, Wr.

The Golden-haired Pipistrel.

♀ 1, Helwak, Satara.

(*See* also Reports Nos. 1, 2, 5, 6, 8, 9 and 19.)

Mr. Thomas has recently dealt with the species *ceylonicus*, (Results xi, Journ. B. N. H. S., XXIV, p. 30, 1915). The present specimen belongs to

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a form which extends over the bulk of the Peninsula. The name of the subspecies is not a happy one; it was given by me to a specimen taken in the Surat Dangs, which now proves to be an aberrant specimen of this race of *ceylonicus*, and consequently the name must stand for the subspecies.

(9) MINIOPTERUS FULIGINOSUS, Hodgs.

Hodgson's Long-winged Bat.

(Synonymy in No. 15.)

♂16, ♀8, in al. 24, Robber's Cave, Mahableshwar, Satara.

(*See* also Reports Nos. 13 and 16.)

In Report No. 13, Miss Ryley recorded this animal as *schreibersi*, but latter specimens show that *fuliginosus* is a better name, for the other belongs to the European form, which is almost certainly distinct.

"There were numbers of these bats in a large cave and judging from the noise they made, which could be heard some way off, I thought they were *Rousettus leschenaulti* till I obtained a specimen. The cave they were in was long and narrow with about a foot of water on the floor."—S.H.P.

(10) KERIVOULA PICTA, Pall.

The Painted Bat.

(Synonymy in No. 5.)

♂1, Ghatmatha, Satara.

It is curious how seldom this animal has been taken by the Survey. It is by no means rare, but apparently very solitary in its habits.

(11) TAPHOZOUS LONGIMANUS, Hardw.

The Long-armed Sheath-tailed Bat.

(Synonymy in No. 6.)

♀5, Khed, Ratnagiri.

"This bat was found hanging on the wall of the courthouse at Khed, about 10 ft. from the ground and just above the gateway in full view of all the passers by."—S.H.P.

(*See* also Reports Nos. 7, 8, 9, 12, 16, 19 and 20.)

(12) PACHYURA sp.

♀8, Helwak, Satara; ♀2, Shirgaum, Ratnagiri.

(13) MUNGOS SMITHI, Gray.

The Ruddy Mungoose.

(Synonymy in No. 7.)

♂1, Helwak, Satara; ♀2, Medha, Satara.

(14) FELIS AFFINIS, Gray.

The Jungle Cat.

(Synonymy in No. 1.)

♂1 (juv.) Helwak, Satara.

(*See* also Reports Nos. 3, 4, 5, 6, 7, 10, 11, 12, 15, 16, 18, 19 and 20.)

(15) VIVERRICULA MALACCENSIS, Gmel.

The Small Indian Civet.

(Synonymy in No. 3.)

♀1, Madha, Satara.

(*See* also Reports Nos. 5, 7, 10, 11, 12, 13, 15, 16, 18, 19 and 20.)

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(16) PARADOXURUS NIGER, Desm.

The Indian Toddy Cat.

(Synonymy in No. 5.)

♂ 2, Helwak, Satara; ♂ 2, ♀ 1, Khed, Ratnagiri.

"In Khed they are very common and almost a nuisance to the shop-keepers, who suffer from the nightly raids made by these animals on their stores. They have a particular attraction for jaggery."—S.H.P.

(*See* also Reports Nos. 7, 8, 11, 13, 15, 18 and 19.)

(17) MUNGOS MUNGO ELLIOTI, Wr.

Elliot's Mungoose.

1915. *Mungos mungo ellioti*, Wroughton, Journ. B. N. H. S., XXIV, p. 52. ♂ 2 (juvs.); ♀ 2, Shirgaum, Ratnagiri; ♀ 1, Khed, Ratnagiri.

(*See* also Reports Nos. 5, 8, 9 and 11.)

In a recent paper in this Journal (l. c.) I divided *mungo* up into several subspecies. The present specimens extend the range of *ellioti* fully 150 miles northwards from Dharwar, the type locality.

(18) CANIS INDICUS, Hodgs.

The Indian Jackal.

(Synonymy in No. 1.)

♂ 1, ♀ 1, Khed, Ratnagiri.

(*See* also Reports Nos. 3, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15, 16, 18, 19, 20 and 21.)

(19) RATUFA INDICA, Erxl.

The Bombay Giant Squirrel.

(Synonymy in No. 5.)

♂ 2, ♀ 2, Helwak, Satara; ♂ 1, ♀ 2, Ghatmatha, Satara.

(*See* also Reports Nos. 6 and 9.)

(20) FUNAMBULUS TRISTRIATUS, Waterh.

The Jungle Striped Squirrel.

(Synonymy in No. 5.)

♂ 14, ♀ 12, Helwak, Satara; ♂ 1, Ghatmatha, Satara; ♀ 2, Shirgaum, Ratnagiri; ♂ 2, ♀ 1, Khed, Ratnagiri.

(*See* also Reports Nos. 5 and 6.)

(21) FUNAMBULUS PENNANTI, Wr.

The Common Five-striped Squirrel.

(Synonymy in No. 1.)

♂ 1, ♀ 2, Karad, Ratnagiri; ♀ 1, Medha, Satara.

(*See* also Reports Nos. 2, 3, 4, 5, 7, 10, 12, 13, 15, 19 and 21.)

Except for a single specimen in the Dharwar Collection this is the most southerly record for this species.

"The commonist squirrel met with up to within thirty miles of the Railway where its place is taken by *F. tristriatus*."—S.H.P.

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(22) TATERA INDICA, Hardw.

The Indian Gerbil.

(Synonymy in No. 1.)

♂ 3, Helwak, Satara ; ♂ 1, ♀ 3, Ghatmatha, Satara ; ♂ 1, ♀ 1, Shirgaum, Ratnagiri.

(*See* also Reports Nos. 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 19 and 21.)

(23) MUS MANEI, Kel.

The Common Indian House Mouse.

(Synonymy in No. 5.)

♀ 1, Helwak, Satara.

(*See* also Reports Nos. 6, 8, 9, 10, 11, 12, 13, 14, 16, 18, 19 and 20.)

(24) MUS BOODUGA, Gray.

The Southern Field Mouse.

(Synonymy in No. 1.)

♂ 1, Helwak, Satara ; ♂ 4, ♀ 4, Shirgaum, Ratnagiri ; ♀ 5, Khed, Ratnagiri.

(*See* also all previous Reports except Nos. 3, 4 and 17.)

(25) LEGGADILLA PLATYTHRIX, Benn.

The Dekhan Spiny Mouse.

(Synonymy in No. 1.)

♀ 1, Helwak, Satara ; ♂ 1, Ghatmatha, Satara, ♂ 13, ♀ 13, Shirgaum, Ratnagiri, ♂ 20, ♀ 15, Khed, Ratnagiri.

"Burrows in the "bunds" which separate the fields. Males were never found in the same burrow as a female which had a litter and generally were caught in holes by themselves."—S. H. P.

(*See* also Reports Nos. 2, 4, 5, 7 and 9.)

(26) EPIMYS RUFESCENS, Gray.

The Common Indian Rat.

(Synonymy in No. 1.)

♂ 9, ♀ 8, Helwak, Satara ; ♂ 2, ♀ 3, Ghatmatha, Satara.

Variety with white underparts :—♂ 1, ♀ 5, Ghatmatha, Satara.

(27) EPIMYS BLANFORDI, Thos.

The White-tailed Rat.

(Synonymy in No. 2.)

♂ 1, Ghatmatha, Satara.

(*See* also Reports Nos. 6, 7, 9, 11 and 19.)

(28) GUNOMYS KOK, Gray.

The Southern Mole Rat.

(Synonymy in No. 1.)

♂ 1, ♀ 1, Helwak, Satara ; ♀ 2, Medha, Satara.

(*See* also Reports Nos. 1, 4, 5, 7, 8, 9, 10, 11 and 12.)

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(29) GUNOMYS LORDI, Wr.

The Konkan Mole Rat.

1891. *Nesocia bengalensis*, Blanford, Mammalia No. 295 (*partim*).
1908. *Gunomys lordi*, Wroughton, Journ. B.N.H.S., XVIII, p. 746.
♂ 13, ♀ 1, Shirgaum, Ratnagiri; ♂ 6, ♀ 2, Khed, Ratnagiri.

(30) BANDICOTA MALABARICA, Shaw.

The Malabar Bandicoot.

(Synonymy in No. 5.)

♂ 1, Helwak, Satara; ♀ 2, Ghatmatha, Satara; ♂ 3, Khed, Ratnagiri.

(*See* also Reports Nos. 6, 7, 9, 10, 11, 12, 13 and 18.)

(31) GOLUNDA ELLIOTI, Gray.

The Indian Bush Rat.

(Synonymy in No. 1.)

♂ 1, ♀ 1, Helwak, Satara.

(*See* also Reports Nos. 2, 3, 4, 5, 6, 7, 10, 11, 15 and 19.)

(32) LEPUS NIGRICOLLIS, Cuv.

The Black-naped Hare.

(Synonymy in No. 5.)

♂ 4, Shirgaum, Ratnagiri; ♂ 1, ♀ 4, Medha, Satara.

(*See* also Reports Nos. 6, 8, 9 and 11.)

(33) SUS CRISTATUS, Wagn.

The Indian Wild Boar.

(Synonymy in No. 5.)

♂ 1 (juv.), Medha, Satara.

(*See* also Reports Nos. 8, 10, 11 and 20.)

(34) RUSA UNICOLOR, Bechst.

The Sambhar.

(Synonymy in No. 5.)

♂ 1, Mahableshwar, Satara.

(*See* also Reports Nos. 11, 15 and 18.)

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THE MAKING OF A HIMALAYAN TROUT WATER.

BY

G. C. L. Howell, F.Z.S., Director of Fisheries, Punjab.

(*With Plates A, B and C and a Map.*)

I have been asked by the Editor to give some account in these pages of the introduction of Brown Trout into the head waters of the Beás River. The object in writing is to let prospective anglers to know what to expect: and (perhaps) to give a few hints as to what to aim at and what to avoid in trout culture in India. The paper ought by rights to have been written by Mr. Mitchell whose work in Kashmir has been of much longer duration and on a far bigger scale than our efforts in the Punjab. But he, the Editor tells me, declines to write. Perhaps the mistakes in this paper will fire him with the determination to correct his pupil. I am indebted to Lt.-Col. R. H. Tyacke for the photographs and to Mr. Charles Lee for the sketches which accompany the paper.

The River and its Tributaries.

"You may keep on breeding trout by the thousand, but you will have no more good trout in the water than you have homes for." Thus wrote Francis Francis in 1883. And he divides "homes" into "houses and homes," and "nurseries." The map gives some idea of the extent of water now in process of stocking. The photographs give a very good idea of its tempestuous character. The novice is apt to think that trout will not dwell in water like this, that they will be "washed away." The fisherman, who knows Norway or Switzerland or The Rockies, or the New Zealand Alps, knows that behind every stone in a glacier fed stream is a stronghold where a lusty fish can lie and wait for his dinner to be washed down to him. These eddies and the great cavities under water-worn rocks are the "houses and homes" for adult fish: and there you will get good trout provided always that the waters contain food: and provided (above all) that nurseries are not lacking wherein the fry can lie in early summer, till they are ready to fend for themselves in heavier water. That the Beás is well provided with such nurseries will be shown hereafter, also that there is no danger of the fish starving for want of natural food.

The true source of the Beás is in the glacial lake known as Beás Kund at the head of the Solang Valley fed from mighty glaciers which hang on the sides of an amphitheatre of peaks running up to 20,000 feet in altitude and formed by the junction of the Bara Bagáhal and Mid Himalayan ranges. For the first 13 miles of its course the summer temperature of the water never rises above 46° F. Below this the temperature rises to a maximum of 56° F. at Sultánpur which is only 4,000 feet above sea level, and knows air temperatures of close on 100° F. The sward of the banks is well timbered with alder: much of the course is in summer pure cascade: but at intervals the bed widens, or is divided up by islands into what might be called (by comparison) "flats." Still men who essay to fish the Beás must be men who have learnt, or are willing to learn, the art of fishing "white water" if they would make big baskets. With some of the tributaries it is different. The lower two miles of the Beás Rikki, for instance, the Sarbarri, the Upper Sainj, and the Tirthan and the Bathád Brook are comparatively quiet waters on which any man who understands Irish or Welsh or Scotch mountain streams should be able to kill fish. Stranger names are always rather a nuisance, so in the Map I have numbered the "reaches" of trout water so far stocked. They are:—

I.—Beás Kund to Palchán with about 6 miles of fishable water.

II.—(Beás Rikki) Ráhla to Palchán with about 2 miles of fishable water.

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III.—Palchán to Manáli with about 4 miles of fishable water.
IV.—Manáli to Kelát with about 6 miles of fishable water.
V.—Kelát to Katrain with about 5 miles of fishable water.
VI.—Katrain to Raisan with about 6 miles of fishable water.
VII.—Raisan to Sultánpur with about 7 miles of fishable water.
VIII.—The Sainj River with about 20 miles of fishable water.
IX.—The Sarbarri River with about 35 miles of fishable water.
X.—The Tirthan and Bathád Reach with about 6 miles of fishable water.

Between Sultánpur and Larji the river will be netted, and trout fishing is never likely to be good. It is never safe to attempt to ford the Beás. It is bridged only at Larji, Bhuin, Sultánpur, Raisan, Katrain, Kelát and Manáli. Above this temporary bridges cross it at Palchán, Solang, and in summer at Dhundi. This means that a man will, as a rule, be able to fish one bank only on the same day, unless he is camped near a bridge.

THE INDIGENOUS FAUNA OF THE RIVER.

I. *Indigenous fish.*—Two species only are native to the Beás above Sultanpur, "Mountain barbel" (*Oreinus sinuatus*) and a small Siluroid or Catfish (*Glyptosternum striatum*). They are known locally as "Gunguli" and "Mochi" [Cobbler] respectively, and the "cobbler" is not sufficiently common to be important. With the barbel it is otherwise. The barbel seem to spawn nearly continuously from March to October, and though the bigger fish—they run up to 3 lbs. or so in weight—drop downstream to the neighbourhood of Sultánpur in winter, the warmer brooks and runners hold fry all the year round. The fecundity of the barbel is the supremely important fact *par excellence* in connection with trout in the Beás. In the Nilgheris, for instance, acclimatised trout tend to increase faster than their food supply; in many New Zealand rivers the same trouble occurs: but in the Beás there is no danger of the barbel being eaten down, and they undoubtedly form and will form one of the staple foods of our *Salmo fario*. For this reason the Natural History of the species should be of interest to all trout fishers: I will not inflict it on my readers here, but content myself with sending the Secretary a small tube containing a few 3 months old trout fry and some of their barbel contemporaries which he may be able to delineate. No one who has ever reared trout fry and lamented their cannibal appetites will have any doubts as to the hospitability which the "little strangers" are likely to extend to any "aborigines" they meet. For a trout thinks nothing of swallowing a fish half his own size and our fry are more than twice the size of the barbel.

II. *Other Indigenous Fauna.*—But even it were not so, even if the barbel disappeared, it is most improbable that the food supply would ever give out. To my mind, and speaking as an enthusiastic fisher, it is a moot point whether "bughunting" in the Beás waters will not be as much fun as angling—so rich is the field for observation. The "small deer" of the river have never been properly worked out, but the bottles of specimens, which accompany this paper and which (again) the good nature of our Secretary may induce him to delineate, give some idea of the wealth of life to be found. Most important of all is a small species of Water Flea (Daphnia) with a long tail, which attaches its shell to the rocks in the coldest glacial torrents. * Snails (Planorbis and Limnaea) are common. † Crabs (*Potomon kuluense*) are found in every marshy spring: the water-cress beds hold a beautiful little clam (Unionid) not yet identified. We have found "bloodworms" (Chironomus ?). Leeches—a valuable mountain trout food—are under nearly every stone in the river.

* In Kulu "Sarpanda." † Sakra.

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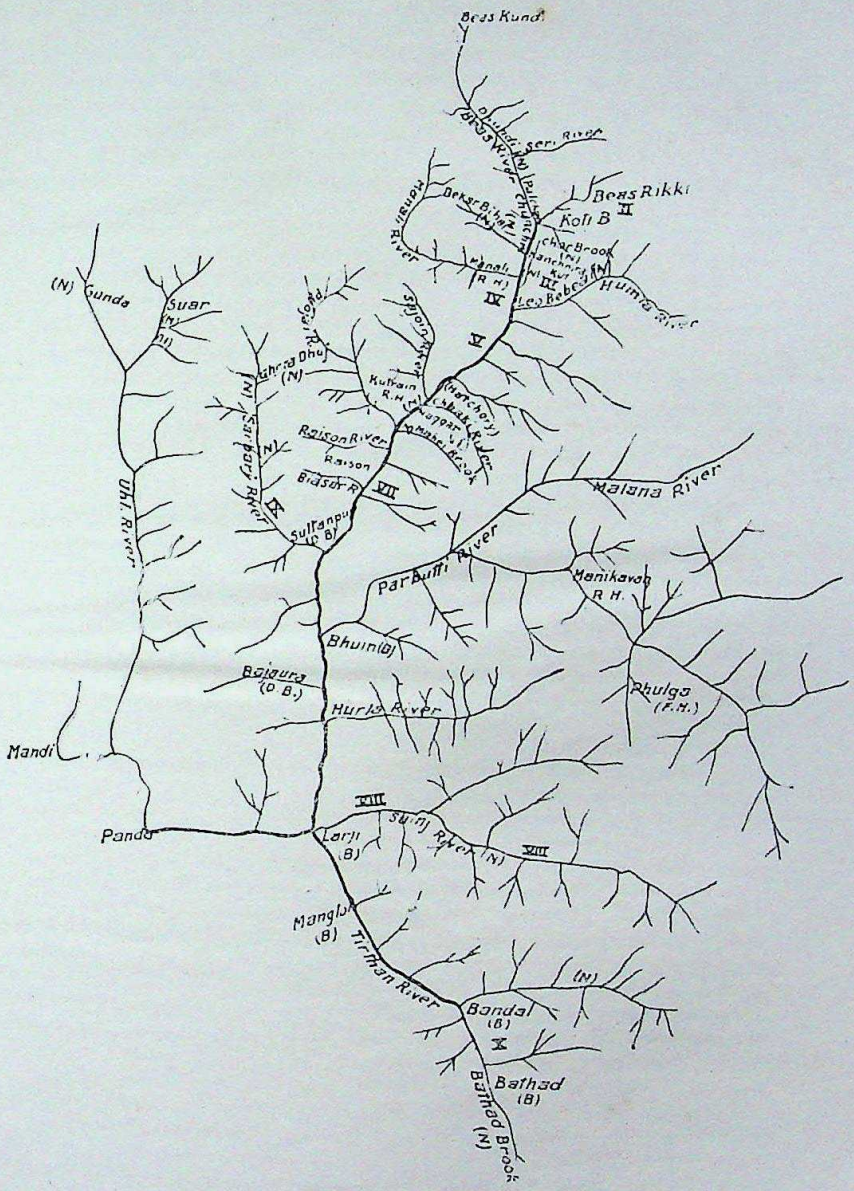

MAP OF THE RIVER BEAS AND ITS TRIBUTARIES.
(N) = NURSERIES FOR TROUT.

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Of the Kulu water flies the commonest are, as is natural in a mountain stream, *Trichoptera* or Caddis, with species akin to *Rhyacophilidae, Hydropsychidæ* and *Lepidostoma*. Other species of which adult flies have been examined by Mr. Martin E. Mosley resembled *Sericostomatidæ*, (Grannom and Welshman's Button) but were said by him to be smaller than English flies thus named by anglers and to resemble more closely the genus *Micrasema* found on the continent of Europe.

Ephemeridæ are hardly less abundant than Caddis, and the commonest type is the flat *Baetis* with semicircular head and very broad legs. Mr. Mosely found a nymph of this type closely resembling the March Brown *Ecdyurus cenosus*: and the large grey larvæ in my collection came from the coldest and most torrential part of the river. In the brooks and runners are many *swimming* larvæ resembling *Cloeon* which produce a two winged fly—rather longer than an Olive Dun. Burrowing larvæ like *Palingenia* with long bodies, small heads, and forelegs intended for digging I have not identified yet in Kulu: but Mr. Mosely found some nymphs of *Ephemerella* which cannot "dig itself in" in the larval state but disguises itself with a shield of mud. This fly closely resembles the Blue Winged Olive. I have caught adult *ephemeridæ* which I should myself have called Olive Duns, Iron Blue Duns, and Yellow Duns in England.

Perlidæ.—Among the bottles sent with this paper are undeniable "Stone flies"—*imagines* and *larvæ*, and this family is represented by several species.

I am no entomologist, however: I only hope that the collection and these notes may one day inspire an Indian Halford to go to Kulu and work out the entomology of the Beás. Enough has been said to assure anglers—for whom this paper is chiefly intended—that there is "fly on the water" and plenty of it. Whether the Beás will ever be a good fly fishing water remains to be seen. Personally I doubt it. Trout all the world over eat more fly *larvæ* and other "underwater" food than they do flies: and the Beás trout certainly take early in life to devouring their Aryan brothers the barbel. On most parts of the river (probably) the spoon and phantom and "creeper" will kill fish more readily than the fly. But—*nous verrons*.

The valley is pastoral and abounds in terrestrial flies and beetles, especially those which breed in the excreta of grazing sheep. These are washed into the river in large quantities during the monsoon, and no doubt feed many trout.

At any rate the river contains "homes": it contains "food".—What of the "nurseries"? And are they well supplied with food?

NURSERIES.

Here the thermometer and microscope come into play. No other Anglo-Indian has a keener nose for a rising temperature than the British trout fry in Indian water. Careful observations on a spring fed stream varying from 52° F. at the source to 68° F. at the confluence with the river and heavily stocked with fry show that trout regard 63° F. as the extreme limit for comfort. When they drop into water as hot as this they do one of two things, *either* run down into the cool river, *or* run up. A few fat lazy fish will move about languidly (languidly that is *for a trout!*) at 63°. But all right thinking troutlets live and flourish and keep their British energy in water at 62° or under. To this rule I have found no exception, and it is certain that even in a troutlet instinct makes no mistake. Now at Katrain (Reach VI) spring temperature is about 60° F. and spring water at 60° heats up to 66° or so after a very short course through an Indian sun. Fortunately there is a brook about 2 miles long there which is fed not only by springs—but by a snow fed runner from a glacier stream which keeps the summer temperature down to about 62°. Between Katrain (Reach VI) and Manali (Reach III) there are very few

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springs which are below 60°. In them eggs will hatch and healthy fish emerge: but directly the April sun heats the water they drop into the Beás. Now this is not sound fishculture. The Beás is a howling torrent in the rains, and a very heavy river as soon as the snow melts in April. It is moreover filling rapidly with large trout only too anxious to pounce upon a bewildered youngster. The object of the fishculturist should be to have as many fry as possible in little brooks and runners fed by springs with a maximum temperature of 60° (or better still 50°) F. right through to September. Such water we have in the Katrain brook: and again in brooks marked N. in the Map all in or above Reach III. These abound in water plants harbouring *entomostraca* and "plankton" of many kinds—some of which are in my bottles of "mixed pickles." The richness of this "plankton" is proved by the fact that fry in these nurseries grow nearly twice as fast as fry reared in captivity: and they remain in the nurseries till the end of the summer and sometimes for a second summer. I have been prolix on the subject of nurseries: but make no apology, for the first great truth of fishculture is—TAKE CARE OF THE FRY AND THE FISH WILL TAKE CARE OF THEMSELVES. To that end we have expended pains on "improving" our Nurseries in several ways, *viz.*:—

i.—By planting additional water-cress where weed was scarce.

ii.—By admitting snow water into such springs as showed symptoms of overheating.

iii.—By blocking up the outfall of one—the Choir Brook—and turning the brook into an old course which gives almost a mile of additional flow, and easy access from the Beás.

We have thus secured nurseries sufficient to rear many millions of troutlets every year: in which they are moreover fairly safe from marauders.

With what Enemies will the "European settler" in the Beás have to contend?

Enemies to Fish.

I. *Poachers.*—*Homo sapiens* (?) in the Inner Hills has not yet developed much ingenuity in the gentle art of destroying fish simply because he has no knowledge of species sufficiently toothsome to inspire him. At present he "fishes fair" for the most part with a casting net. A heavy spate drives trout to the banks to seek for the surface food washed in by the rain, and at such times they can be taken easily enough with a casting net. But unless the water is well coloured experiment shows that trout are much too quick for the most skilful netsman, and they generally lie in heavy water where a net must carry away. There will be little difficulty in preventing netting in the reaches reserved for anglers. That fish poaching will sooner or later attract Kulu men—once they have acquired a taste for trout—goes without saying. But that time is not yet. The main danger will be poisoning and diversion of the Nursery streams.

II. *Fish.*—The old trout themselves will no doubt take toll of their progeny. But barbel are always to be had, and much more easily caught than trout, and I believe with Mr. Mitchell that trout do not as a rule take the trouble to hunt down their own species except in default of other fish diet. At any rate autopsies on fish caught in the river have disclosed so far only one wild troutlet as a victim to cannibalism in Kulu.

III. *Otters.* (*Lutra leptonyx*)—A greatly exaggerated evil. I have watched an Otter at work for hours (without his knowing it) from a point where every motion was visible. He fished hard the whole time, and caught nothing in a pool full of fish. I agree with Mr. Armistead that an Otter lives on many things besides fish; that it is only on confined waters like a stock pond that he does *wholesale* damage to fish, and in my heart I do not

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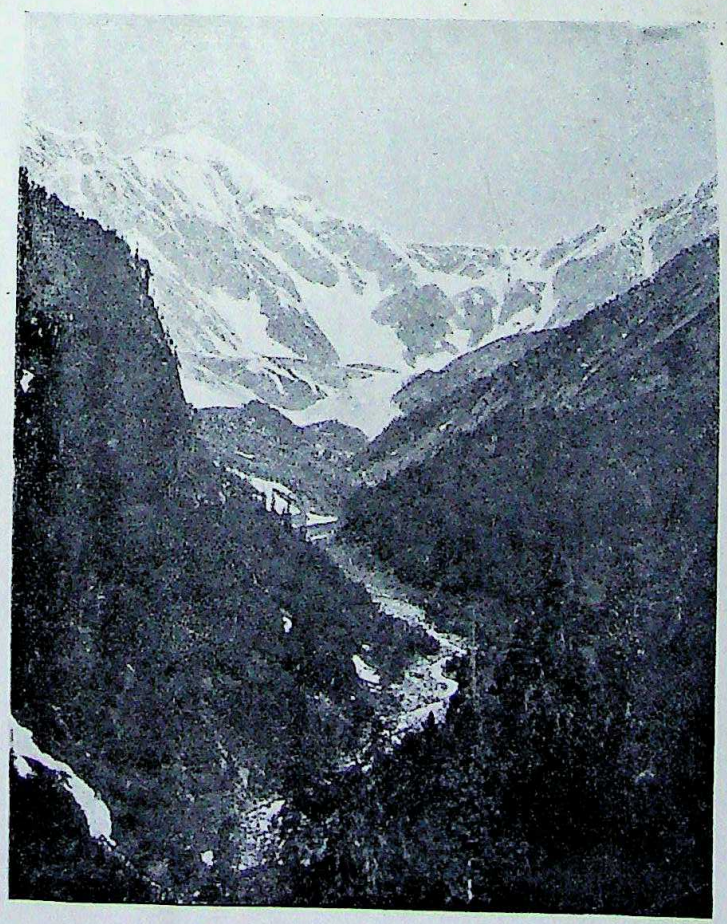
A Canon in Reach II, Beas Rikhi.
The Beas as it flows through the Kothi Gorge.



The Source of the Beas.
Snowy Peak Beta (β), 19,400 ft., and the Beas Kund Nala.

THE MAKING OF A HIMALAYAN TROUT WATER.

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grudge him a trout or two. But he is commoner than he should be in Kulu, and very reluctantly I pay rewards for his destruction.

IV. *Birds.—Cormorants* (NÉIAR K.) abound in winter below Sultánpur. They will spread upstream. It is (alas!) hard to kill them, for the only good cormorant is a dead cormorant, as long as a living one eats his own weight of fish in a day. *Kingfishers* are I rejoice to say fairly common. So long as they keep away from the nurseries I (for one) grudge them no fish they can eat! An occasional heron turns up below Sultánpur, but I have never seen one catching anything but frogs. "Dippers" and water Ousels bear one cheerful company on every reach of every stream. I once shot a "dipper" (*horesco referens!*) accused by a false witness of having that moment swallowed a trout fry. His stomach contained no food of any kind whatsoever! The rest of the clan may eat their fill of trout (but I am sure they will not!) in expiation of that crime. Caddis worms: dragon fly larvæ: beetles: and frogs. All these will do much damage to eggs and larval fish. But the real fact is that in torrents like the Beás, active fish, like trout, can take care of themselves pretty well against all predatory animals, *once they have gained their poise in the water.*

THE STOCKING WITH TROUT.

Into these waters trout were first placed in 1909. The statement below gives the numbers of fish actually released in each year: it will be noticed that of the original 22,862* fish planted (they came from Kashmir as "eyed ova") a big majority were placed in Reach No. V with a few in Reaches III and VI. The object was to obtain a stock of heavy fish at the lower end of the valley (in Reaches VI and VII) as quickly as possible. It was anticipated that trout would tend to work downstream rather than upstream, and this anticipation has turned out to have been correct. By 1913 it became clear that Reaches V, VI and VII held a very fair stock of brown trout. We had meanwhile held up a stock of brood fish—29 females and 20 males. These have spawned in our Stock Ponds ever since 1912: and the plants from their progeny have been 110, 9,600, 41,253 and 51,406 fish in four successive years—a not unsatisfactory rate of progression.

No. of Reach.	1909.	1912.	1913.	1914.	1915.	Total.
I ..	..	..	..	1,000	19,618	20,618
II ..	..	110	9,000	3,050	..	12,160
III ..	2,050	..	600	15,310	13,994	31,954
IV ..	..	..	..	1,700	..	1,700
V ..	18,812	..	..	4,480	259	23,551
VI ..	2,000	..	..	..	1,910	3,910
VII ..	..	..	..	..	..	..
VIII ..	..	..	..	4,980	..	4,890
IX ..	..	..	..	1,233	6,844	8,077
X ..	..	..	..	9,500	8,781	18,281
Total ..	22,862	110	9,600	41,253	51,406	125,231
Add—Uhl ..	..	..	..	241	..	241
				Total Out-turn ..		125,472
				Of which we brought from Kashmir ..		22,862
				Balance bred in Hatchery ..		102,610

* For a photograph of a large Kashmir Brown Trout from which probably some of these ova came, see Miscellaneous Note page 371.

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NATURAL REPRODUCTION.

It is a little hard of course as a rule to say that a particular trout caught anywhere in the river is or is not one of the fish bred in and released from the Hatchery. But in June 1914 and again in June 1915 large numbers of trout fry about 2 inches long, considerably larger than their domesticated contemporaries who averaged only an inch, were caught and examined in the Katrain Brook Nursery in Reach VI. This brook was stocked with 2,000 eyed ova in 1909; and has been left to its own resources ever since. It is fed both by springs and by snow water and is in every way an ideal little trout stream running through alder copses with deep holes, overhanging banks, and water-cress beds at frequent intervals. It is practically certain that neither in 1914 nor in 1915 could any fry planted by us have found their way into this brook: nor would domesticated fry have attained an average length of 2 inches by June. The inference is irresistible that they are the progeny of wild spawners. We have other evidence to show that trout are breeding in the river, but the Katrain case is in itself conclusive.

THE "ARTIFICIAL" PROPAGATION OF TROUT.

The Why and the Wherefore.—This being so I am frequently asked "why, if fish breed naturally, go to the expense of breeding them artificially?" The answer is simple. In Nature—which has not allowed for the destruction caused by mankind—very few fish survive through the egg stage and the larval stage to adult trouthood. The eggs have of course no means of defence: the larvæ or alevins can move indeed but cannot steer a course or make any connected effort to avoid a pursuer: and in that tragic world which lies beneath the surface of the waters there is no thought of Mercy for any living thing which can neither fight nor flee. The enlarged sketch (Fig. i) of a trout larva or "alevin" with "sac" attached will give readers

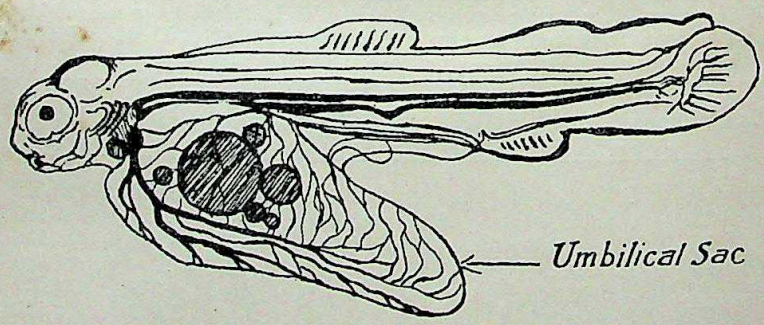

Fig. 1.

who have never seen one some idea of his helplessness. He is obviously not built for manœuvre! The two first stages then of a trout's existence form a period of great peril. Dragon fly larvæ, caddis worms, some of the water beetles, frogs and older trout are some only of the enemies who eat eggs and "alevins." Now with water at $43\frac{1}{2}^0$ F. mean temperature this period of danger lasts no less than 135 days, at a temperature of 50° it is reduced to 77 days, *but is greater while it lasts*, inasmuch as the warmer water makes the insect enemies less sluggish in their movements. It is clear that between November and April the daily toll of all young fish in a state of nature must be immense. Fishculture, in one sentence, eliminates that danger period altogether.

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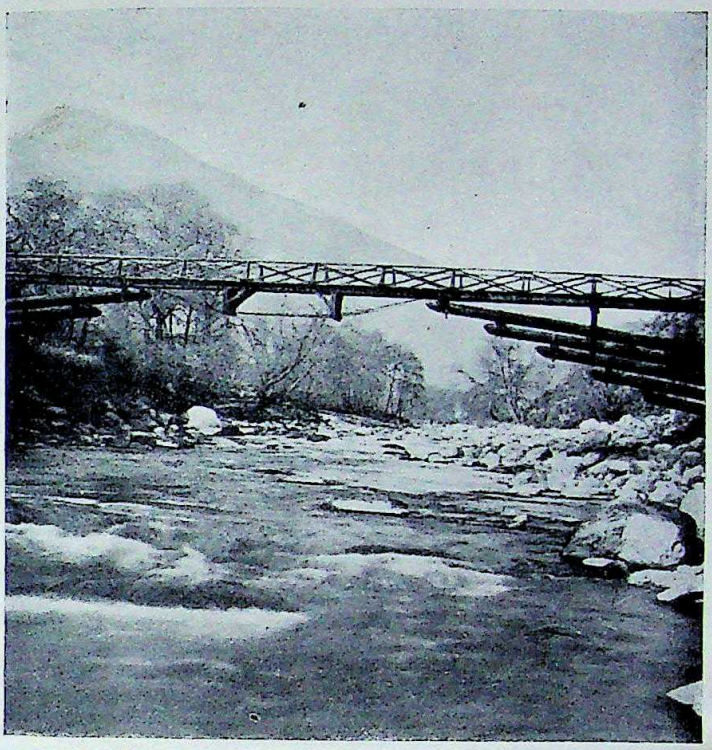

Boundary of Reaches VI and VII. The Beas at the Raisen Bridge.

Reach V. Beas below Kangra Cotton, Hardwah.

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THE MAKING OF A HIMALAYAN TROUT WATER.

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In a Trout Hatchery the eggs are hatched, and the alevins reared behind fine screens of perforated zinc: so far as animal enemies go, they are absolutely safe until they have found their poise in the water, and once a troutlet can swim he swims like lightning, and develops moreover a most extraordinary instinct of self preservation. From this time forward he is safe from frogs and insect pests, and though the older fish or a wandering kingfisher may take an occasional fry, there is no more *wholesale* destruction. Our breeding stock of 49 fish gave us over 40,000 fish in 1914. Had they spawned in open water and left their eggs to take their chance among their natural enemies, it is fairly safe to say that not more than 400 or 500 of their progeny would have survived to become fry. "Artificial" rearing needs no more defence. Its usefulness in stocking virgin waters or in preventing wastage in waters which are very heavily fished is self-evident. There is nothing "unnatural" in it. It is merely a case of supplementing Nature's methods.

The Method.—Books cannot teach the method. I am safe in promising that if anyone wants to learn how to breed trout the Punjab Government will gladly teach him in Kulu where he should spend five months from November to March. Briefly the method divides itself into the following processes:—

(*i*) Fertilisation.
(*ii*) Eyeing.
(*iii*) Hatching and planting eyed ova.
(*iv*) care of alevins.
(*v*) Care of fry and planting fry.

(*i*) *Fertilisation.*—By November 18th the females are ready to strip. The eggs are carefully expressed into a moist basin in an adhesive mass. Milt is meanwhile collected from the male fish into a dry "thermos" flask*, is poured on to the eggs, and well mixed up with them by hand. An inch of water is poured into the pan and kept in circular movement to prevent adhesion to the basin. After about 3 minutes the milt is washed off and the eggs are poured into zinc trays (Fig. ii-*a*) fastened in a box (Fig. ii-*b*)

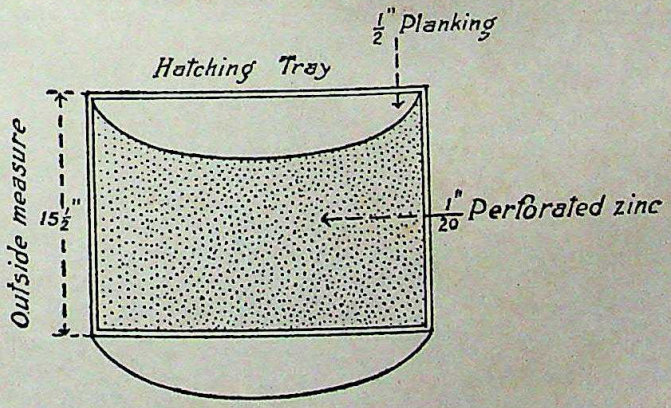

Fig. II (a)

with a gentle flow of water over them. In 15 to 45 minutes the eggs separate, and are left to "eye". During the ensuing period they are known as "green" eggs and are extremely delicate. Our six years old females still

* The spermatazoa when mixed with water die within two minutes. If excluded from air and moisture they retain their vitality for six days at least.

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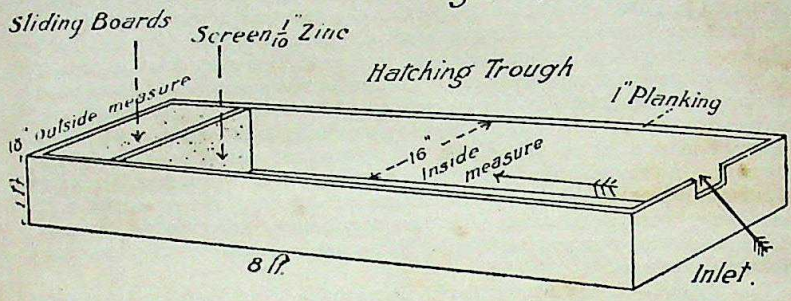
give us splendid ova, but a male trout in India is at his best when one year old, and his milt "goes off" after the third year.

Fig. II(b)



(ii) *Eyeing.*—The green eggs must be picked over daily and with extreme care, for at this stage the slightest shock will kill them. Those which are unfertile or in which the embryo has been killed turn white and will infect the whole hatch with fungus unless they are at once removed. If the water temperature is 50° F. the eye of the fish will appear in 23 days at 54° in 15 days, at 41° in 49 days. Generally speaking, in India it is advisable to use water of 50° to 55°, for throughout this period the eggs are extremely delicate, and Indian operators are not as a rule capable of sustained attention to detail, so that the period should be shortened so far as is consistent with healthy development. 50° may be taken as the most favourable temperature for "eyeing." Once the eyespots have appeared the eggs are quite hardy and can be moved without danger.

(iii) *Planting Eyed Ova.*—The eggs can now be allowed to hatch out either in the natural Nurseries which it is intended to stock, or in the Hatchery. For the former method it is impossible to improve on Mr. Mitchell's "*Pahári*" Hatching Box (Fig. iii), a sketch of which is attached.

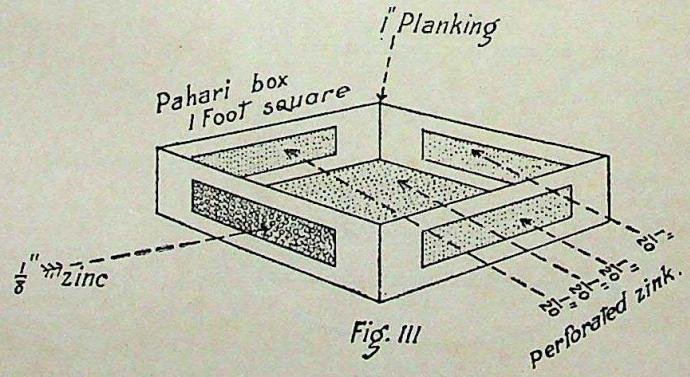


Fig. III

The eggs are packed in boxes on trays protected by moss, and covered with snow, and carried out to the springs. There they are transferred into *pahári* boxes about 2,000 to a box—covered with a lid to exclude the light, and left to hatch out. At a temperature of 50 the alevins will all be hatched out in 47 days: thirty days later the fish will begin to feed on the minute entomostraca in the water; the holes at the top end of the box are

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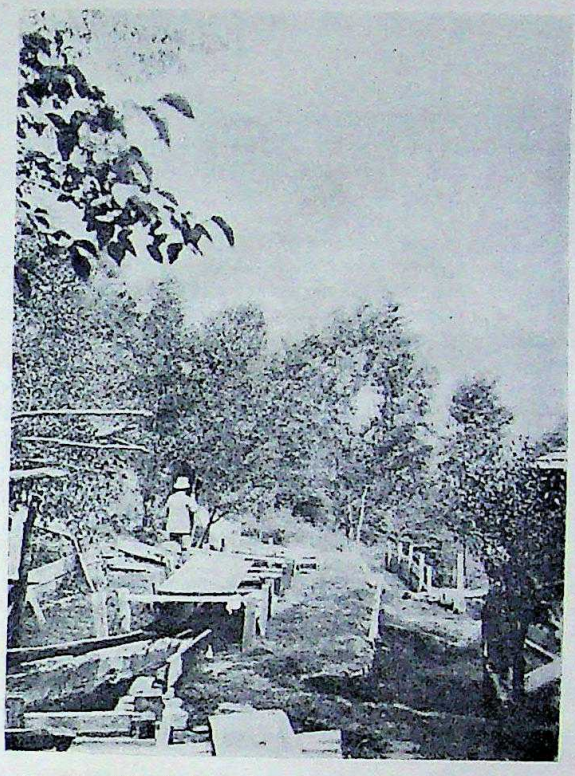
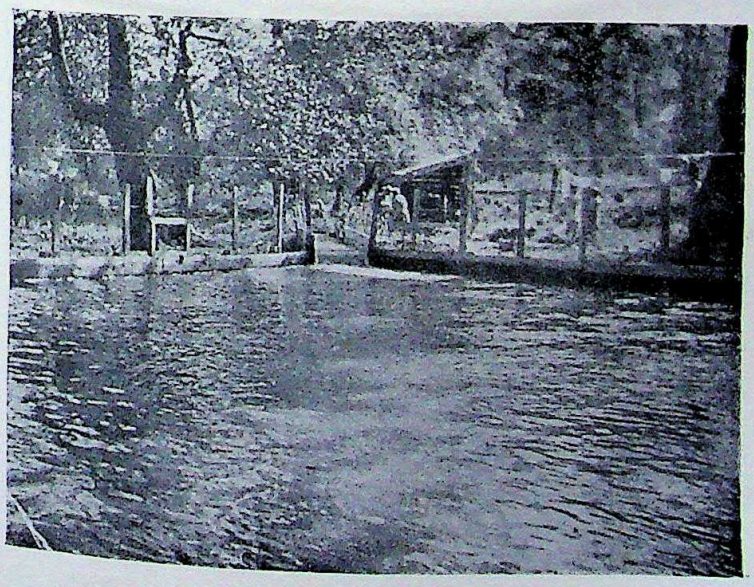


Rearing Pond No. II. Note planks for shade.



Stock Pond, Brown Trout, Kulu.

THE MAKING OF A HIMALAYAN TROUT WATER.

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made large enough to let a fish swim away upstream and fend for himself as soon as he is sufficiently advanced to do so. The great advantage of this method is that fish are from the first dawn of consciousness "wild" fish feeding on natural food. It eliminates the human element and all danger of mistakes in feeding. It is a *sine qua non* that the water chosen should abound in Natural Food, which roughly speaking will be the case wherever water cress and other water plants grow: the spring should not exceed 55° in temperature, and its maximum summer temperature should not exceed 63° F. It is necessary to employ a man to "pick over" the eggs in all boxes distant from the Hatchery, *i.e.*, to remove all "dead" eggs and alevins. This method succeeds best in spring water with a constant temperature. Snow water varies immensely in temperature and is subject to spates especially in March, and these variations kill alevins in large quantities.

(*iv*) *Care of alevins.*—The hatching process in the Hatchery is exactly similar. Alevins require no food as they live on the contents of the umbilical sac which is figured in the illustration. (Fig. i). If possible I should always rear only the 200 or 300 fry which were required for "brood stock" and plant all ova in *pahári* boxes. But this is not practicable. Some of the best nurseries are inaccessible till March or April when the snow melts, or are liable to be buried in avalanches. To stock these places one must rear fry till they are three or four months old.

(*v*) *Care of the fry.*—This is not an easy business. It means feeding the trout as soon as the umbilical sac is nearly absorbed. Nature succeeds in this process. Man is apt to make mistakes. We at any rate have always had heavy losses during this period, and working as we do with Indian labour we shall never eliminate the loss. We have found that barbel flesh pounded into a very fine solution to the consistency of thin white soup makes good feed. Our chief mistake has been to keep fish too long in the Hatching boxes. They should in India be turned out directly they come on the feed into a Rearing Pond with water 3 feet deep, a heavy flow and plenty of room. This will ensure them the more natural food that is

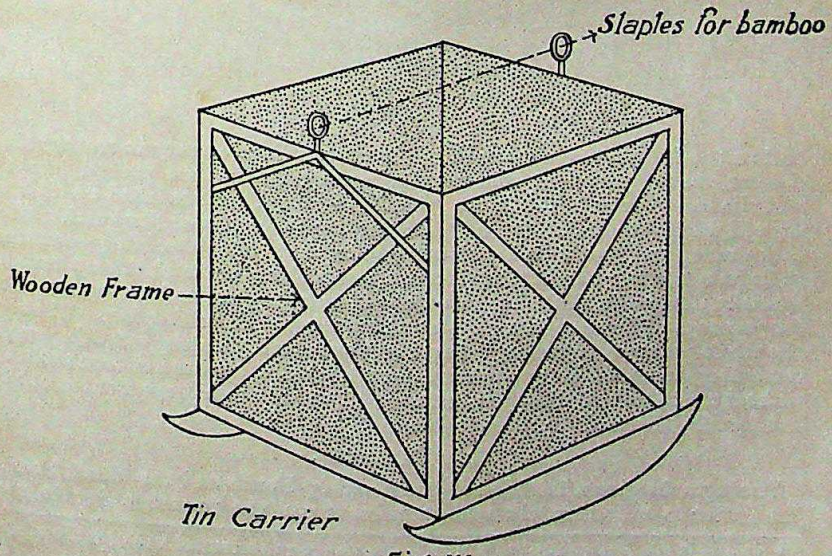

Fig. IV

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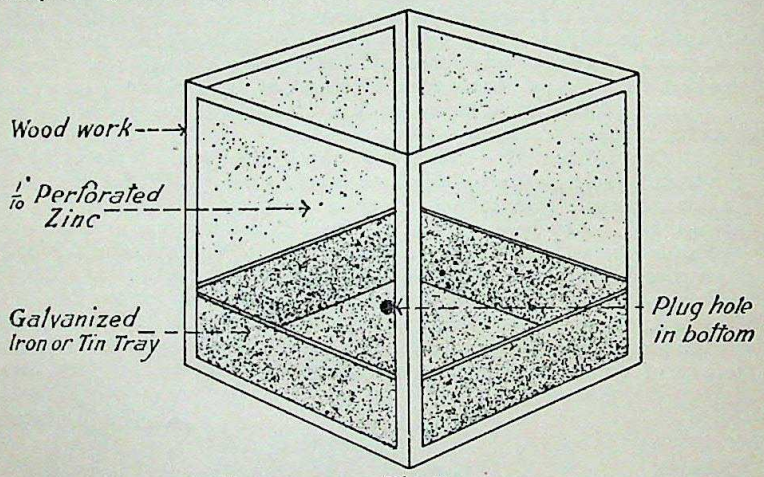
brought down the inlet of the hatching boxes and will hasten growth, for fish will never grow unless they have "range." In a box most of the food is taken by the stronger fish, unless they are fed with greater care than the average Indian keeper is capable of and the strong fish very soon take to feeding on their weaker brethren.

Planting fry.—By May and June it should be possible to have all the fry out in Nursery streams. They should be collected from the Rearing Pond in the evening after six hours at least of starvation, and placed in 4-gallon tin carriers (Fig. iv): each carrier will for an ordinary journey up to 16 hours carry 500 fry. The top should consist of a perforated tray exactly like the tray of an ordinary "live bait can." The tin should fit into a wooden frame on rockers*: and this should be covered with cloth to be kept wet so as to reduce temperature by evaporation in sunshine. The first part of the march should always be done at night. With each carrier should go a live car (*vide* Fig. v) the upper part of perforated zinc, the lower of tin: at the



Live Car Fig. V

bottom is a hole with a cork in it. Whenever it is necessary to rest fry the live car can be placed in cold running water: the fry are poured into it, and allowed to swim about in the "car." When the car is lifted up all the fry will be in the tin at the bottom: the car is held over the carrier, the cork drawn, and the fry fall back into the carrier. It is absolutely essential in India never to "handle" fry if it can be avoided; and with this apparatus specially devised in Kulu, we have moved trout fry as well as coarse fish for journeys of three or four days at midsummer with trifling loss. That is the whole process of stocking: "eyeing" ova: and planting out *either* eyed ova *or* three months old fry as circumstances require. It has not been evolved without mistakes and disappointments. It would never have worked at all but for Mr. Mitchell's help and advice.

The Hatchery.

Photographs give a fair idea of the Rearing Ponds and the Stock Pond. The latter is unfortunately some 2 miles from the former owing to my

* The rockers are to enable a hill coolie to rock the carrier with his toe when he is resting or smoking. Such rocking keeps the water aerated.

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initial mistake in the choice of the site which left no room for expansion. In any country where wood is cheap tanks lined with timber planed and varnished with asphaltum* are economical to construct and maintain and easy to clean. Every Pond should be built with a small depression or trap 8 or 10 inches deep in the boarding of the bottom: as the water is run off all the fish congregate in this trap and this saves much handling and hunting. The dimensions of our ponds are: Rearing Pond No. I, 11′×4′×3′. No. II, 26¼′×5½′×3′. No. III, 41½′×5′×4′. No. IV, 38½′×6½′×5′. Stock Pond 72′×34′ (extreme width). We have an unlimited supply of highly oxygenated water, and no disease has so far appeared among the fish. For stock the procedure adopted is to hold up about 200 fry in No. I; one year old fish in No. II; and two year old fish in No. III. The two year olds are moved into the Stock Pond in October (or earlier if their size warrants it): and the fish in Nos. I and II are then sorted over the three tanks according to size. Of course any exceptionally well grown fish must always he removed or he will devour his companions. It is most important to keep one pond with earth sides and bottom alongside the Stock Pond: any fish which looks weak or out of sorts is immediately put into this, and the tonic properties of the earth soon revive him. Without such a "hospital" I should be sorry to hold up a large stock of fish in any cemented or timber lined pond.

As this paper is written the stock of fish ready to spawn next November consists of 61 females and 39 males. At least 22 wild males will be caught to balance the sexes. In No. III we have 15 females and 10 males. In No. II 46 one-year old fish and in No. I 229 fry. No. IV Rearing Pond is reserved for old pensioned cock fish of the original 1909 stock who are useless as breeders, but interesting objects of observation. They run to nearly 9 lbs. in weight now.

Results observed.

At risk of exceeding my space I must summarise some of the results observed in the Beás. In 1910 (summer) a dozen trout were caught at Katrain (Reach VI) ranging from 8″ to 11″ long. In 1911 a 3½ lb. fish (female) was caught near the same place measuring 20″×11¾″ (Reach VI). She was full of barbel fry. In April 1912 a 3-year old trout was caught at Mandi (60 miles downstream) which measured "nearly two feet" in length. In 1913 fish were continually netted by men catching barbel in Reaches III, IV, V and VII: they ran from 8 to 12 inches in length and were certainly fish spawned naturally. In 1914 two officers fishing for 14 days from 26th May to 24th June caught 34 fish weighing 32½ lbs. chiefly in Reach VI, but 3 in Reach V and 2 in Reach IV. In August 3 fish were caught of one lb. each in Reach III, and two of 1½ and 1¼ lb. in Reach VI. A ½ lb. fish was taken on fly in Reach VI in June. All the rest were taken either on phantoms, spoons or worm. These represent casual experimental efforts, and they show clearly enough that the species is spreading and that it will come to the rod. In the Autumn 9 fish were caught in Reach VI for breeding purposes ranging from ½ to 1 lb. No angling has been done in 1915. But the men netting barbel for the stock fish to eat caught so many trout that I have had to stop netting altogether above Sultanpur. After a shower of rain a few days ago I sent out our head fisherman to catch males for the stock pond. In three days (fishing about an hour each day) he caught 5 males averaging 2½ lbs. and 17 females which were returned. A few days ago a 2½ lb. cock fish came

* Asphaltum is the residuum left from coal tar after boiling out all its volatile constituents. In solution with turpentine it forms the "asphaltum varnish" of commerce. Two coats will generally prevent fungus from growing on wood.

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down the inlet into one of the Rearing Ponds from the Chakki River: water in which wiseacres have assured me trout would never lie.

Four hen fish were netted on July 2nd and July 3rd for autopsy and "scale reading" as follows:—

	Reach.	Length.	Girth.	Weight.*
(*i*)	VI	10¼″	6½″	11·3 oz.*
(*ii*)	VII	12½″	7½″	17 oz.*
(*iii*)	Below Reach VII at Sultanpur	15″	10″	30·9 oz.*
(*iv*)	Ditto ..	12″	8″	19·5 oz.*

The biggest fish had an empty stomach. No *iv* had recently swallowed a large snail 2½ inches long, in the stomachs of the others were found Caddis *larvæ*: Caddis *pupæ*: Stonefly wings, ephemerid flies: beetle larvæ. One had swallowed a glittering piece of mica ½ an inch long—a hint to spoon fishers. None of them had eaten any barbel fry though the river was full of them. All were caught in heavy water.

So much for the experiment: I have shown I hope that the fish are in the Beás awaiting the return of normal times when soldier men may have time to fish for them, and that all the natural conditions are in favour of the stock increasing. Other people are breeding trout in other parts of the Himalaya. It goes without saying that I shall always be glad to exchange ideas with them, and I shall perhaps get at them better through these pages than through those of blue books which wise men read only under compulsion. This must be my excuse for the inordinate length of this paper.

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* These fish weigh about 25 per cent. more than average English fish of the same length. This is due no doubt to the plentiful feed in the Beás, and to the torrential character of much of it's course, which secures oxygenation at all points.

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THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED

BY

E. BLATTER, S.J.

PART XV.

(*With Plates LXXXI-LXXXIII.*)

(*Continued from page 71 of this Volume.*)

ARECA, L. Gen. Nat. 1225.

Gaertn. Fruct. I., t. 7, fig. 2.—Mart. Hist. Nat. Palm. III, 1169, 311, t. 102, 149.—Kunth Enum. Pl. III. 183, 637 (excl. sp.)—Bl. Rumph. II. 64, t. 99, 100, fig. 1, 101, 102, A, B, C, 108; III, t. 160, 163, D.—Griff. Palms Brit. Ind. 146, t. 230 (section Pinanga)—Miq. Fl. Ind. Bat. III, 8 (Arecæ sect. 1).—Scheff. Ann. Jard. Bot. Buitenz. I. 112, 132, 144, t. 1-8.—Drude Bot. Zeitg. 1877, t. 6, fig. 16, 17—Becc. Males. I. 17. (excl. subg. 3) 97.—Rgl. Gartenfl. 1879, 199.—Benth. & Hook. Gen. Pl. III, II, 833, 1.—Hook. Fl. Brit. Ind. VI, 405.

Stem erect, smooth, green in the upper portion, annulate. Leaves pinnate; base of petiole expanding into a smooth, green, amplexicaul sheath; leaflets thin, often confluent, with several midribs, attached to the rhachis in a vertical line.

Spadix androgynous, below the leaves, branched, bearing numerous close-set spikes; spathes several. Male flowers many, minute, occupying the upper portion of the spikes; sepals small; petals much longer, obliquely lanceolate, valvate; stamens 3 or 6; filaments short; anthers basifixed, erect. Female flowers much larger, few at the base of the spikes; perianth accrescent; sepals and petals orbicular, imbricate, the petals with acute valvate tips; ovary 1-celled; stigmas 3, sessile; ovule 1, basal, erect.

Fruit ovoid or oblong, supported by the persistent perianth; mesocarp fibrous. Seed with a truncate base; endosperm deeply ruminate; embryo basilar.

Species about 16.—Tropical Asia and Australia.

CULTIVATION IN EUROPE.—Very ornamental and graceful stove palms. They grow very well in a compost of loam, peat, and leaf soil, in equal parts, with a liberal addition of sand. When fully developed they prefer a compost with about two-thirds of loam and some rotten cow-manure. The seeds germinate in a compost similar to the one first mentioned; they must be placed in a moist gentle heat. These palms are very effective, in a young state for the decoration of drawing rooms and dinner tables.

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A.—STAMENS 6—
1. Fruit 1½-2 inches, smooth, orange or scarlet ... *A. catechu.*
2. Fruit 1½ inch, umbonate, reddish yellow ... *A. concinna.*

B.—STAMENS 3—
1. Fruit 1 inch, narrowed at both ends ... *A. nagensis.*
2. Fruit the size of an olive, tip truncate ... *A. triandra.*

ARECA CATECHU, L. Spec. Pl. 1189; Roxb. Corom. I, p. 54, t. 75; Flor. Ind. III, 615; Mart. Hist. Nat. Palm. III, 169, t. 102 et 149; Kunth Enum. III, 184; Blume Rumph. III, 65, t. 102 A et t. 104; Griff. in Calc. Journ. Nat. Hist. V. 135; Griff. Palms of Brit. Ind. 147; Miq. Fl. Ind. Bat. III, 8; Kurz For. Fl. II, 536; Gamble Man. Ind. Timb. 421; Scheff. Arec. 9; Scheff. in Ann. Jard. Buitenz. I, 144, t. I. V, III, f. 2.—Fifel et Fufel, Avicenna L. I, c. 262.—Avellana indica, Serapion c. 136; Garcia ab Horto Aromat. I, c. 25.—Areca, Ramusio 1588, I, p. 160. F. p. 312 B.—Faufel, Lobel Stirp. Observ. 1576, p. 641; Clus. Exot. 1605, p. 187, Obs. p. 641.—Areca. s. Faufel s. Avellana indica, versicolor, Park. Raii. Hist. II, p. 1363.—Palma areca s. Bonga minor, Camell. Luzon apud Raii Hist. III, p. 45.—Palma arecifera, Pluk. Almag. p. 275, excluso icone t. 309, f. 4.—Areca faufel, Gaertn. Fruct. I, 19, t. 7, f. 2.—Areca hortensis, Lour. Fl. Cochinch. 568.—Caunga, Rheede Hort. Mal. I, p. 9, t. 5-8.—Pinanga, Rumph. Amb. I, p. 26, t. 4.

Names of the tree:—*English*: Betel* nut palm, areca nut palm, areca palm, betel nut tree, betel palm, cashoo nut tree, catechu palm, catechu tree, drunken date tree, faselnut, faufel nut tree, pinang palm.

French: Arec, arec cachou, arec de l'Inde, arèque, aréquier, noisette d'Inde.

German: Arecapalme, Arekapalme, Betelnusspalme, Betelpalme, Katechupalme, Catechupalme, Kaupalme, Pinangpalme.

Names of the young leaves.—*English*: Palm cabbage.

French: Chou palmiste.

German: Palmkohl.

Dutch: Palmkool.

Names of the fruit.—*English*: Areca nut, betel nut, Indian nut.

French: Aveline d'Inde, aveline des Indes, noisette d'Inde, noisette des Indes, noix d'Arec, noix de bétel, pinangue.

German: Arecanuss, Arekanuss, Arekasamen, Bandwurmnüsse, Betelnuss, Indianische Nuss, Indianische Haselnuss, Katechunüsse Pinangnuss.

Dutch: Arecanoot, areeknoot, betelnoot, pinang, pinangnoot.

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* The name Betel or Betle is Malayan in origin and simply means "a leaf", and came to English through the Portuguese Betre.

("By these and other names was originally meant Piper Betel leaf—the Pan—though subsequently these and many other names were appropriated to the nut or to the special preparation of leaf, nut, lime and spices ready to be chewn. This was first designated bira (vira) viti in Sanskrit; but ultimately became pan, the pawn or pan-supari of modern writers."—Watt).

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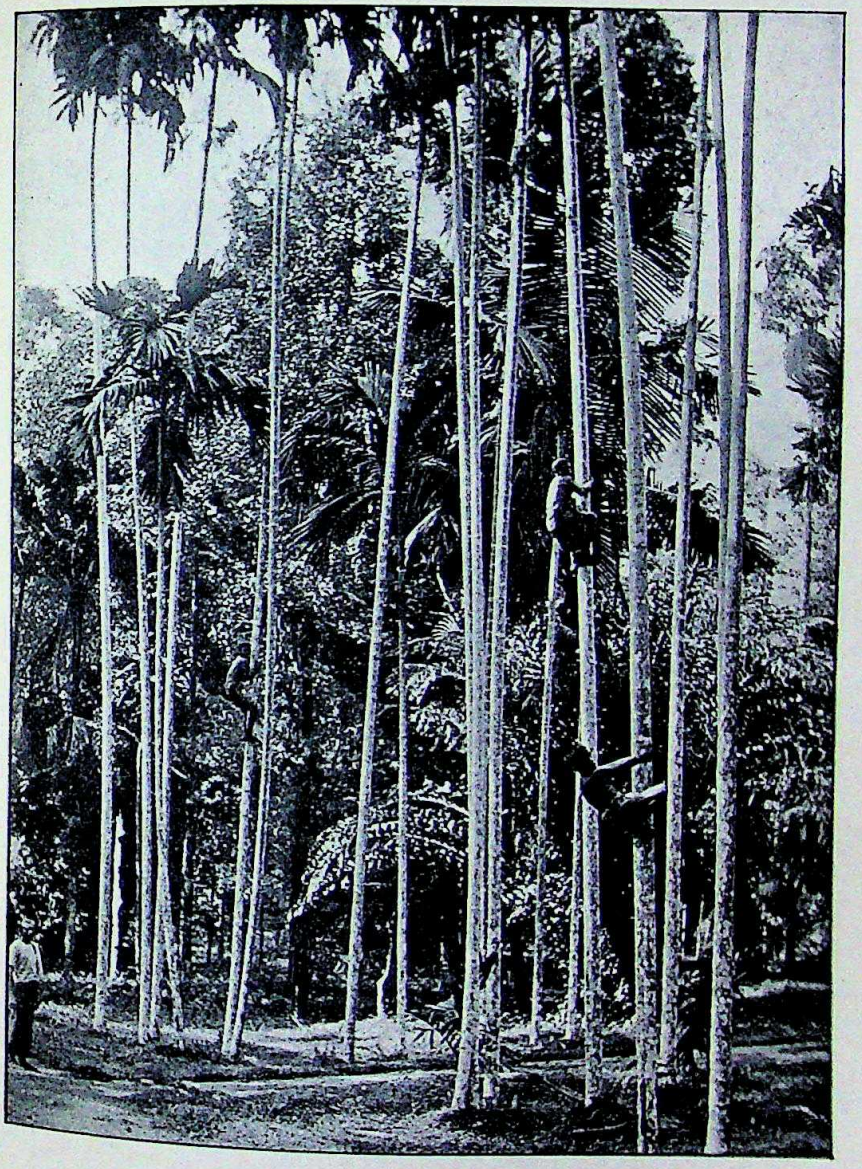

BETEL NUT PALMS (*Areca catechu*, L.).

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Hind. and *Dekk.*: Supari, supyari.
Beng.: Gua, supari.
Ass.: Tambul.
Tel.: Poka-vakka, vakka.
Tam.: Kamugu, pakku, kottai-pakku.
Kan.: Adike.
Guj.: Sopari, hopari, phophal.
Mar.: Supari.
Mal.: Adaka, kavugu, atakka.
Sans.: Puga-phalam, gubak.
Arab.: Fofal, fufal.*
Pers.: Gird-chob, popal.
Singh.: Puwak, puvakka.
Jav.: Bhunghana penang, Jambe, Jebug.
Burm.: Kwam-thee-beng, kunsi, kun, kun-thee-bin.
Andam.: Ah-bud-dah, ah-purrud-dah.
Modern Malay.: Pinang.
Philippines: Bonga, Bunga, Luyos.
New Britain: Bue.
Pelew Islands: Bua.
Duke of York Island, Solomon Group: Boa.
Amboina: Puah, Buah.
Banda: Pua.
Guam: Pugua.

DESCRIPTION.—Trunk solitary, quite straight, 40-100 feet high, usually about 20 inches in circumference, uniformly thick. Leaves 4-6 feet, leaflets numerous, 1-2 feet, upper confluent, glabrous.

Spathe double, compressed, glabrous. Spadix much branched, bearing male and female flowers. Rhachis stout, compressed; branches with filiform tips. Male flowers very numerous, sessile, without bracts; calyx 1-leaved, small, 3-cornered, 3-parted; petals 3, oblong, rigid, striated; stamens 6, anthers sagittate. Female flowers solitary, or 2 or 3, at or near the base of each ramification of the spadix, sessile, without bracts; sepals 3, cordate, rigid, fleshy, permanent; petals 3, like the sepals, permanent; staminodes 6, connate; style scarcely any; stigmas 3, short, triangular.

Fruit 1½-2 inches long, smooth, orange or scarlet.

HABITAT.—The Betel-nut Palm is cultivated exclusively within the moist tropical tracts that fringe the coast of India, and practically within a belt of land that, with a few exceptions, does not extend inland for more than 200 miles. It rarely ascends to attitudes of 3,000 feet and gradually disappears, even from the littoral area, as localities are entered where the duration of the dry hot months equals or exceeds the monsoons. It is usually seen as a garden plant, but

* Fufal, a corruption of "pupal" (Per.), a word cognate with pugi phal (Sansk.).

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occasionally, and in certain localities, especially of Western and Southern India, of Ceylon and of Burma, where the soil and climate may be exceptionally favourable, it is grown in special gardens along with Coco-nut, Plantain, Orange, Mango, etc., and either with or without the pan (piper betel) climbing on the palm-stems. In Eastern and Northern Bengal, in some portions of Assam, and in Ceylon its cultivation has assumed still greater dimensions. In certain districts of these provinces regular plantations of 5 to 20 or even 100 acres in extent occur and at such frequent intervals that they might almost be said to constitute a distinct agricultural feature scarcely less important than the combined crops raised on the intervening portions of the country (Watt).

The exact native country of the Betel-nut Palm is uncertain. It is difficult to trace its original spot as the tree has been extensively cultivated, from time immemorial, in all parts of the East Indies. On the continent of India, in Ceylon, and Cochin-China the species is always mentioned as cultivated. So in the Sunda Isles, the Moluccas, etc., to the South of Asia. Blume says that the habitat of the species is the Malay Peninsula, Siam, and the neighbouring islands, though he does not seem to have seen the indigenous plants of which he speaks. Bretschneider considers the plant to be a native of the Malay Archipelago, principally of Sumatra, for he says that those islands and the Philippines are the only places where it is found wild. The first of these facts is not confirmed by Miquel, nor the second by Blanco, who lived in the Philippines. To De Candolle Blume's opinion appears the most probable, but he adds: "We must still say with Martius, 'the country is not proved.'"

Mr. C. E. C. Fischer, I.F.S., writes to me:

"Areca catechu is said not to be wild in India, but I have found it growing in the Attapadi valley of Malabar in dense ever-green jungle where it seemed to me obviously wild. The forest was virgin and not secondary growth after cultivation. The local hill men, who do not use the fruit of the trees, declared it to be wild. I found it in fruit on 21st May 1911. The soil was a deep rich vegetable loam; elevation 3,000 feet." (Cf. No. 2776 of Fischer's collection in Herb. Calc.)

HISTORY.—We borrow the following account from Watt:—The betel-nut is a masticatory of great antiquity with all Asiatic races, best known as suvaka, puga, kramaka (Sansk.), fufal (Arab). The nut is symbolical of festivity; it is accordingly a fit offering for the gods, and is an essential at the betrothal ceremony. From the most ancient times the presentation of pan has been the polite termination of ceremonial visits, hence the expression bira-dena—the dismissal. The best known vernacular names for the nut are—supari, gua gaya, kasaile, mari, tambul, oka, kamuga, adike, kunsi, etc.

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It would seem that the earliest historic reference by a European to the habit of chewing betel-nut occurs in the writings of Marco Polo (1298 A. D.). "All the people," he wrote, "have the habit of keeping in the mouth a certain leaf called tembul." Subsequently Vasco da Gama (in 1498), Varthema (in 1510), Barbosa (in 1516), Garcia de Orta (in 1563), Abul Fazl (in 1590), Linschotten (in 1598), François Pyrard (in 1601), Roe (in 1615), Jacobus Bontius (in 1629), Bernier (1656-68), Vincenzio Maria (in 1672), give similar accounts. Adams in his translation of Paulus Aegineta refers to the Betel-nut as introduced to Materia Medica by the Arabs. He quotes amongst others the passages referring to it from Avicenna, Haly-Abbas, Ebn Baithar, Elmasudi, Serapion, and others. Ebn Baithar says that it is the fruit of a palm, and observes that it is a gentle purgative, makes the breath fragrant, is a cordial, and strengthens the gums and teeth. Linschotten remarks that "the Indians goe continually in the streets and waies with Bettele or Bettre and other mixtures in their hands, chawing, especially when they go to speak with any man, or come before a great lord."

Abul Fazl apparently never saw the palm growing, since he likens it to a cypress tree that sways in the wind till it touches the ground. This circumstance may be accepted as showing that from very ancient times, as at the present day, the nut has been carried to regions remote from the area of its production.

Economic uses.—For the medical and economic uses of the plant I quote from Drury: "The nut is used as a masticatory in conjunction with the leaf of Piper Betel and Chunam. It is considered to strengthen the gums, sweeten the breath, and improve the tone of the digestive organs. The seed, reduced to charcoal and powdered, forms an excellent dentifrice. Dr. Shortt states that the powdered nut, in doses of ten or fifteen grains every three or four hours, is useful in checking diarrhœa arising from debility.

"The dry expanded petioles serve as excellent ready-made splints for fractures.

"The catechu which the nuts yield is of a very inferior quality. There are two preparations of it, which are respectively called by the Tamools, Cuttacamboo and Cashcuttie; in Teeloogoo, Kansée, and in Dukhanie, Bharabcutta and Acha-cutta. The first (Cuttacamboo) is chewed with the betel-leaf.

"Like most of the Palm tribe, the trunk is much used for ordinary building purposes, and in Travancore is especially used for spear-handles, etc. The spathe which stretches over the blossoms, which is called Paak-muttay, is a fibrous substance of which the Hindoos make vessels for holding arrack, water, etc., also cups, dishes, and small umbrellas. It is so fine that it can be written on with ink.

"In Travancore the nuts are variously prepared for use. Those that are used by families of rank are collected while the fruit is

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tender; the husks or the outer pod is removed; the kernel, a round fleshy mass, is boiled in water: in the first boiling of the nut, when properly done, the water becomes red, thick, and starch-like, and this is afterwards evaporated into a substance like catechu. The boiled nuts being now removed, sliced, and dried, the catechu-like substance is rubbed to the same and dried again in the sun, when they become of a shining black, ready for use. Whole nuts, without being sliced, are also prepared in the same form for use amongst the higher classes, while ripe nuts as well as young nuts in a raw state, are used by all classes of people generally; and ripe nuts preserved in water with the pod are also used."

Heyne describes the mode of extracting the catechu from the nuts in Mysore in the following way: "The nuts are taken as they come from the tree, and boiled for some hours in an iron vessel. They are then taken out, and the remaining water is inspissated by continual boiling. This process furnishes kossa, or most astringent terra japonica, which is black, and mixed with paddy-husks and other impurities. After the nuts are dried they are put into a fresh quantity of water and boiled again, and this water being inspissated like the former, yields the best or dearest kind of catechu, called Coony. It is yellowish brown, has an earthy fracture, and is free from the admixture of foreign bodies." On account of the large quantity of tannin which these nuts contain, they have been employed in some parts of India for dyeing cotton clothes. In Malabar an inebriating lozenge is prepared from the sap of the tree, and in Khasia according to J. D. Hooker's statement, the natives measure distances by the number of mouthfuls of betel-nut chewed on the road. It seems that the poorer classes use various substitutes for the betel-nut, *e.g.*, the seeds of Calamus erectus Roxb.

In Guam betel chewing is a matter of etiquette at all wedding assemblies, fandangos, and funerals. Nuts deprived of their fibrous envelopes, fresh pepper leaves and quicklime, together with cigars, are passed around to the assembled guests.

According to Jahns, arecaine, the active principle of the areca nut, is a powerful agent for destroying tape-worms, resembling in its action pelletierine, an aromatic, oily alkaloid obtained from the bark of the pomegranate. Like nicotine it is poisonous, half a grain sufficing to kill a rabbit in a few moments. It influences the respiration as well as the heart, causes tetanic convulsions, and has an extraordinary influence in increasing intestinal peristaltis. Locally applied or when given internally it contracts the pupils. In India the nut has long been used as a vermifuge, the dose being a teaspoonful of the freshly grated kernel.

According to G. King the nut is useful in checking the pyrosis of pregnancy. Control experiments made with tincture of catechu

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have shown the superiority of the nut, and would seem to demonstrate that this is not merely due to astringent action; it is quite possible that its property as a nervine stimulant enhances its utility.

CULTIVATION.—It would be too long to describe the different methods of cultivation adopted in various parts of India and extra-Indian countries. We confine ourselves to reproducing what Watt says on the cultivation in Bengal*; as to the rest of India we refer our readers to the numerous Gazetteers which contain interesting particulars on this subject.†

"In the districts of Backerganj and Noakhali the Areca palms are planted in groves of mandar (*Erythrina indica*). These enrich the soil, afford shade from the intense heat and protection from sudden wind storms. Branches of the mandar, some 6 feet in length, are planted in rows, 12 to 15 feet apart each way. The planting is done in February to April, and from 2 to 6 years later these plantations are ready for the seedling palms. The betel-nuts are sown in October or November, the seeds being deposited 4 or 5 inches apart, and the nurseries are either close to the homesteads in shady places, or if conveniently situated, they are made in the mandar groves themselves. The transplanting is usually done after 2 years, sometimes 3 or 4 years. For high lands the seedlings are transplanted in July, for low land in February or April. In the first transplanting the betel-nuts are placed equi-distant from the mandar trees and thus 12 to 15 feet apart. But a second regular transplanting takes place when the first have come into bearing. Before this is done the mandar trees are cut down or only a fringe left around the circumference of the grove. The betel-nuts in a fully planted grove are thus about 6 to 7 feet apart each way. A certain amount of irregular planting takes place, however, as vacancies occur, and in selfishly conducted plantations the trees may be found here and there not more than 2 or 3 feet apart. It is probable that there is a certain amount of self-sowing, as it is not unusual to find two or three trees growing in a clump so close to each other that they could not be healthy. In most plantations also a distinct percentage of cocoanuts are interplanted among the betel-nuts, so that an old plantation in many cases has lost all its original regularity and becomes a dense jungle of palms with only a winding footpath leading to the owner's house. This generally stands on the bank of a tank and near the middle of the holding.

"The seasons of flowering and fruiting may be said to be distributed throughout the year. The flowers that form in January will ripen fruit in October; the flowers formed in March will fruit in December and January. The harvesting period is from October to

* Watt, G. Commercial Products of India, p. 84.

† See also N. V. Kelkar,—The Betel-nut Palm and its Cultivation in North Kanara. Poona Agricultural College Magazine, Vol. VII, No. 1 (1915).

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the beginning or middle of January, but occasionally the new flowers may begin to form in December or January on trees from which last year's fruits have not been collected.

"If a few trees are planted near villages, but not in regular groves, the betel-nut may fruit when it is only 6 or 7 years of age. In plantations they rarely fruit before the tenth or twelfth year. The trees subsequently put out in the plantation (just as the first set begins to flower) do not come into bearing for 20 years. There is no third planting except, as already stated, to fill up vacancies. Land formerly covered with betel-nuts, if re-planted with them, even after a rest of several years, in the form of mandar groves, does not, as a rule, yield until the palms are 20 years old. It will thus be seen that it takes at least 30 years before a betel-nut plantation comes into full bearing. The fruiting life of a tree may be put at from 30 to 50 or 60 years after maturity, and the total life of the tree might thus be stated at from 60 to 100 years.

"The soil of the Bengal plantations is the ordinary grey sandy loam on which rice is grown. Occasionally the plantations are surrounded by a ditch and wall made of the soil thrown up from the ditch, but this appears to be more intended for protection than for drainage" (Watt).

On an average each tree produces two bunches of fruit, sometimes three or four. But two good bunches yield as much as three or four inferior ones. The manure used and the rainfall determine the size of the bunches. A good bunch gives 200 to 300 nuts and a specially good one about 400. Unfavourable rain or cloudy weather in April or May causes many of the young fruits to fall off and allows only a smaller number of nuts on each bunch to reach maturity.

Diseases and Pests.—E. J. Butler * described in 1906 a disease of the betel-nut palm which had been known in the Malnad districts of Mysore particularly near Koppa for many years. In 1910 a fuller account of the same disease was given by L. C. Coleman.† It is chiefly from the latter paper that we borrow the following details. The reader is referred to the more extended and fully illustrated account which the same author has published as a Bulletin of the Agricultural Department of Mysore.

The disease in question is known in Kanarese, the chief language of the Mysore State, as "Koleroga", which means simply "Rot Disease."

The disease has been observed with certainty only in the extreme western parts of Mysore. "The area affected consists of an extent situated in the Western Ghauts and extending practically from the extreme North of the State to a point about 80 miles Southward.

* Butler, E. J.—Some Diseases of Palms. Agricult. Journ. India, I (1906) 299.
† Coleman, L. C.—Diseases of the Areca Palm. Ann. Myc. VIII (1910) 591.

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It has a width in its widest part of about 30 miles. This area coincides pretty closely with the area of heaviest rainfall, the rainfall ranging between approximately 100 inches and 300 in a year..... By far the greater part of the rain falls between the months of June and September and it is during this time that Koleroga is prevalent in Mysore." The disease has, besides, been reported from North Kanara, South Kanara, from a small tract in Malabar adjoining Cochin State and from Cochin State itself. Mr. Butler informs me that lately the disease has also spread to Dharwar.

" The disease ' Koleroga ' usually makes its first appearance towards the end of June, about two or three weeks after the beginning of the rains. It restricts itself for the most part to the nuts themselves, but occasionally passes over into the tops of the palms in which case they very speedily succumb. The nuts soon after they are attacked begin to drop from the trees and it is this dropping of diseased nuts which signals the advent of the disease to the garden owners. Its spread is usually remarkably rapid so that within a few weeks an area of many acres may have become badly infected."

The cause of this disease is a fungus belonging to the genus *Phytophthora*. To Coleman it seems rather doubtful whether this fungus should be considered as a distinct and new species. He finally decides for placing it with *Phytophthora omnivora*, but as a distinct variety, *viz*, var. *Arecæ* until such time as he will be able " to make a thorough search for alternate host plants and until the different *omnivora* forms have been carefully investigated. " This fungus has since been raised to the rank of the species: *Phytophthora Arecæ* (Col.) Pethy.

The owners of betel-nut gardens have themselves invented a method of protection against the disease. They cut covers made of the basal sheaths of the big leaves and tie them over the bunches so as to protect them from the rain. This method is not very satisfactory and the disease may under certain conditions be favoured rather than checked by the coverings. Coleman thought that spraying with Bordeaux mixture might prove successful. The results of a year's spraying which he collected and published show that he was not mistaken.

According to Mollison, a borer does considerable damage to the betel-nut palms. " It cuts a tunnel from the root upwards and in time reaches to the growing top. The damage there done is so considerable that the top withers and when wind blows breaks off and falls to the ground. "

Of Godavari, it has been said that termites often injure the palm materially by eating the rootlets (Watt).

ILLUSTRATION.—Plate LXXXI shows a group of Betel-nut Palms taken by Mr. Macmillan in the Botanic Gardens of Peradeniya.

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In appearance the Betel-nut Palm is perhaps the most graceful and elegant of Indian Palms. The erect and slender trunk is of dark-green when young, and of a dark-grey colour when old. The circles formed by the clasping petioles of the leaves are distinctly visible upon the stem. The summit terminates in a tuft of dark-green foliage. The fruit ripens only once during the year. At this period the tree has a beautiful appearance, long bunches of orange oval-shaped fruit hanging from the upper parts of the trunk, contrasted by the dark-green foliage.

ARECA CONCINNA. Thw. Enum. 328 (1864); Hook., Fl. Brit. Ind. VI, 406; Trim. Fl. Ceyl. IV, 322.—A. dicksonii, Roxb. (?). Moon Cat. 66, C. P. 620.

NAME.—Len-teri (Ceylon).

DESCRIPTION.—Trunk 8-12 feet high, $1\frac{1}{2}$-$1\frac{3}{4}$ feet in diameter, cylindric, green. Leaves few, 3-$3\frac{1}{2}$ feet long, spreading, subglabrous. Leaflets 2 feet long, $2\frac{1}{2}$ inches broad, lanceolate, falcate, caudate-acuminate, lower simple, 1-costate, upper of 2 or more confluent, acuminate or toothed at the apex, terminal shorter, more or less confluent in toothed laminæ.

Sheath 16 inches long; spadix paniculately branched, a foot or more long, very shortly peduncled; rhachis short, stout, compressed, smooth, branches filiform, terminating in pendulous male spikes. Male flowers biseriate, $\frac{1}{10}$ inch long; sepals oblong, obtuse; petals nearly thrice as long, obliquely ovate-lanceolate, acuminate, striate; stamens 6; anthers subsessile, linear-oblong, acute, cells parallel, pistillode trigonous. Female flowers $\frac{1}{3}$-$\frac{1}{4}$ inch long; calyx an obscure unequally 3-lobed cup; petals broadly ovate-oblong, obtuse.

Fruit $1\frac{1}{2}$ inch long, subfusiformly ovoid, umbonate, scarlet.

HABITAT.—Forests of the moist low country of Ceylon. Subaragamuwa, Reigam Korale, Pasdun Korale (Endemic in Ceylon).

FLOWERS in September.

CULTIVATION IN INDIA.—This palm is occasionally planted; the fruits, however, which are also chewed with betel, like *A. catechu*, are generally obtained from wild trees (Hooker.).

ILLUSTRATION.—The dense tuft of *Areca concinna* on plate LXXXII grows in the Botanic Garden of Peradeniya. The photograph was kindly supplied by Mr. Macmillan.

ARECA NAGENSIS, Griff. in Calc. Journ. Nat. Hist. V, 156; Palms Brit. Ind. 129; Hook. f. Fl. Brit. Ind. VI, 406.

Name of the palm in Naga, Tal-pat; Singpho name, Tongtau; name of the nut in Naga, Kave; in Assam, Tamul.

DESCRIPTION.—This species is not well known, Griffith deriving the description of it from imperfect specimens of leaves, an imperfect spadix with immature fruit, and a perfect fruit.

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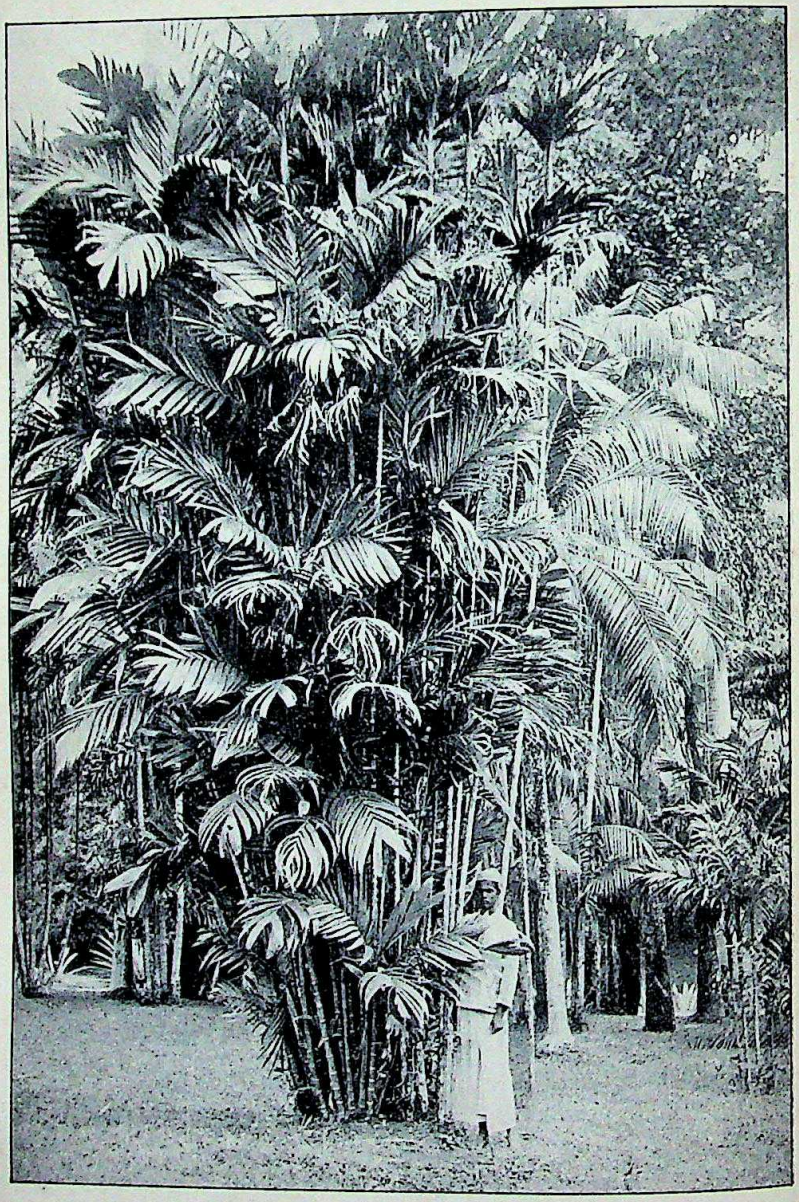

Areca concinna, Thw.

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Areca triandra, Roxb.

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The trunk rises from 30-40 feet high and is attached to the soil by innumerable black fibrous roots. The leaf stalk is naked for about three feet, the blade measuring about four. "Pinnules sub-opposite or alternate, falcate, very acuminate, nineteen or twenty inches long, about one and a half inch broad, above with two or three stout keels; the terminal one deeply bilobed, variously partite, the laciniæ or divisions bidentate; the less divided broader part is obliquely truncate with irregular teeth." To this description Griffith has added the note: "The leave may be open to doubt, from their resemblance to those of *Areca gracilis*." (*Pinanga gracilis*, Blume).

The spadix measures about one foot; the compressed peduncle is divided, from near the base into stout flexuose branches. The female flowers are on the lower parts of the branches, each with a scale-shaped bract. "Sepals round, oblong, obtuse; petals larger, sub-cordate with a short obtuse cuspis.

Fruit oblong-ovate, one inch long and 5 lines wide, attenuated to both ends, base surrounded by the perianth, apex rostrate mammillate, truncate, with a small mammilla in the centre; fibres numerous, stout, whitish. Seed erect, ovate, half an inch long, marked with many veins arising from the hilum, these are generally dichotomous, anastomosing reticulately on the dorsal face. Albumen cartilaginous, horny, ruminate, opaque white. Embryo basilar." (Griffith.)

HABITAT.—Naga Hills, up to 800 feet, very scarce, usually on high situations on river sides.

USES.—The Nagas and Abors use it as a substitute for the betel-nut.

ARECA TRIANDRA, Roxb. Hort. Beng. 68; Fl. Ind. III, 617; Ham. in Mem. Wern. Soc. V, 310; Mart. Hist. Nat. Palm III, 171, t. 149, fig. 1, 2, 3; Griff. in Calc. Journ., Nat. Hist. V, 154; Palms Brit. Ind. 148, t. 230, A; Kurz. For. Fl. II, 537; Hook. f. Fl. Brit. Ind. VI, 406.

NAMES.—Bungua, Ramgua, Runi Supari (Beng.).

DESCRIPTION.—The palm is shrubby and throws out offsets at the base. The green, distinctly annulate stem grows five to seven feet high and has one inch and a half in diameter. The leaves are bright green and comparatively large, being four to five feet long. The pinnules are alternate, linear ensiform, often falcate, obliquely acuminate, thirteen to sixteen inches long, one and a half to two inches broad, with one, two or three keels above; the upper ones are more or less split at the apex; the terminal leaflets are broadly cuneate, deeply bipartite, forked, the lobes themselves truncate and having as many bidentate lobes as there are keels on their under-sides.

The green smooth spathe has a short blunt point, and is from six inches to a foot long and from two to three inches broad.

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The peduncle and branches of the much divided spadix are compressed. A linear bract, half an inch in length, is to be seen at the base of the lowermost branch. The branches are spreading and much divided; the secondary divisions are stoutish towards the base, where they bear a female flower, close to which they branch into two slender flexuose spikes, from which the male flowers arise, or oftener are attenuated into one. "Male flowers angular, small, cream-coloured, in pairs pressed together and secund on the outer side of the spikes. Sepals three, minute, ovate-oblong, unequal. Petals oblong, obtuse, valvate, three or four times longer than the sepals. Stamens three, opposite the sepals; filaments stout, short, united at the base; anthers sagittate. Rudiment of the pistillum conical subulate. Female flowers rather large, generally placed between a pair of rudimentary males, suffulted by two broad, short, pointed bracts. Sepals roundish, green. Petals similar, but smaller, and less tough. Six very small rudimentary stamens. Ovary ovate, one-celled, white. Ovule one, ascending. Style o. Stigma of two, or generally three erect unequal acute lobes. Fruit oblong, of the form of an olive, but longer, distinctly mammillate, smooth, when ripe of a lively orange colour, at length becoming red. Pulp in small quantity, and mixed with many longitudinal strong, ligneous fibres. Seed conform. Albumen much ruminated. Embryo basilar" (Griffith).

HABITAT.—Chittagong, Martaban, Tenasserim, the Andaman Islands, Malay Peninsula.

FLOWERS in the hot and rainy season; fruit ripens the following year.

ILLUSTRATION.—We reproduce on plate LXXXIII a group of *Areca triandra* which was photographed by Mr. Macmillan in the Botanic Garden of Peradeniya.

(*To be continued.*)

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A NEW MARMOT FROM CHITRAL.

By Oldfield Thomas.

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By the kindness of the authorities of the Bombay Natural History Society I have been entrusted with the determination of a Marmot obtained at Chitral by Capt. H. O. Stirling, and presented by him to the Society.

The species is the smallest of the group of Golden Marmots, of which the handsome *Marmota caudata* of Kashmir is the largest and best-known member. The new form may be described as follows :—

Marmota stirlingi, sp. n.

Size smallest of the group. General colour approximating to the rich orange-tawny found in *M. littledalei*, distinctly more tawny than in *aurea* and *flavina*. Fur of back smoky brown at base, then becoming, for the terminal half of the wool-hairs, ochraceous buff, beyond which again the larger hairs darken to ochraceous tawny, their extreme tips black. Below, the fur is more broadly brown at the base than in the allied forms, the buffy tips of the hairs not hiding their brown bases, so that the colour may be said to be brown washed with buffy; in the other species there is little or no brown on the buffy hairs. Sides of neck and shoulders grizzled greyish, the long hairs black with buffy subterminal rings. Top of muzzle with a distinct black patch; crown grizzled buffy, nape ochraceous tawny like back. Arms and legs rich golden buffy. Hands and feet similar, some black hairs at the bases of the claws. Tail for its basal three-fourths buffy, with brownish bases to the hairs, the terminal fourth blackish brown.

Skull smaller than in other members of the group, the molars distinctly lighter.

No flesh measurements available; hindfoot, dried, 72 mm.

Skull, distance from back of postorbital process to lambdoid crest 37; zygomatic breadth 53·4; intertemporal breadth 17·4; upper tooth-row 20; front of p^4 to back of m^3 17·5; breadth of p^4 4·6; lower tooth-row 19·3.

Habitat.—Chitral. Type from "head of Chitral Nullah, 11,000'."

Type.—Adult male. B. M. No. 15.7.1.10. Original number 5. Collected April 1914, by Capt. H. D. Stirling. Presented to the National Museum by the Bombay Natural History Society.

This species is distinguished from the other members of the group by its smaller size, the greyish grizzling of the sides of the neck and shoulders, and the greater amount of brown on the belly.

On examining all the members of this group of marmots I find that *Marmota littledalei*, the Pamir Marmot, is more closely allied to

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Blanford's *aurea* than I supposed when describing it, but may be distinguished by its tawny instead of golden buffy general colour.

The five forms of the group may be provisionally distinguished as follows:—

A. Size largest. Upper tooth-row upwards of 22·5 mm. Back broadly washed with blackish ... ... *caudata.*

B. Size smaller. Back golden or tawny, with but little black.

a. Upper tooth-row about 21 mm. Belly buffy with but little or no brown at base of hairs. Sides of neck not grizzled.

a[1]. Back tawny, a dark tail tip ... ... *littledalei.*

b[1]. Back golden-buffy.

a[2]. A dark tail tip. Top and sides of neck alike buffy ... ... *aurea.*

b[2]. Tail tip scarcely darker. Nape much darker than sides of neck ... ... *flavina.*

b. Upper tooth-row 20 mm. Belly hairs broadly brow basally. Sides of neck grizzled ... ... *stirlingi.*

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LIVERWORTS OF THE WESTERN HIMALAYAS AND THE PUNJAB, WITH NOTES ON KNOWN SPECIES AND DESCRIPTIONS OF NEW SPECIES.

BY

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I.

MARCHANTIALES.

The following notes are the results of the observations by the writer on Liverworts collected by him during the years 1912-14 in various places in the Western Himalayas from Mussoorie to Kashtwar. Some of the species have already been fully described by the writer elsewhere. Only the names of such species are given with the proper reference.

Liverworts are very closely allied to mosses along with which they form the class "*Bryophyta*." The plants, unlike the mosses, are not always leafy but may be only thallose, and even when leaves are present they are arranged in two or three characteristic rows. Just like the mosses the plant bears sooner or later a fruit-body—the sporogonium, the most essential part of which is the Capsule. The Capsule, however, is not so well differentiated in Liverworts as in mosses. It has no columella (except in the *Anthocerotales*), no peristome, and no distinct apophysis. It has, however, spirally thickened, elongated cells—the *elaters*—mixed with spores, which, are absent in the moss capsule.

The only work on Indian Liverworts is Mitten's *Hepaticæ Indiæ Orientalis* published some fifty years ago and in the light of later information, an enumeration of the species of this group is urgently needed.

NOTE.—All the specimens were found by the writer in places indicated unless otherwise stated.

Marchantia palmata, Nees. Found at Mussoorie. It was found by the late L. Bashambar Das, Assistant Professor of Biology, Government College, Lahore, also near Sialkot. The plant also occurs in Lahore, but it never produces any ripe fruits here. Specimens from Sialkot were also sterile. Both male and female plants are found in Lahore.

The plant has a definite mycorrhizal region in the central part of the thallus, the cells there being filled with fungal hyphæ densely.

In a specimen from Lahore the stalk of the female receptacle was seen to divide into two near its upper end, the undivided lower part being 5 mm. long, while each of the branches was 1 mm. long. Each branch had a perfectly normal receptacle on the top. The main stalk showed four rhizoid furrows in two pairs, while each of the branches had only one pair.

Another specimen from Mussoorie showed that a lobe of the male receptacle after forming antheridia for some time had begun to form ordinary vegetative tissue with even a gemmæ-cup. The same specimen had an ordinary vegetative shoot arising from the ventral surface of another lobe of the male receptacle. These conditions were observed in one of a patch of plants which were growing in a very moist and shady place which was therefore peculiarly favourable for vegetative growth.

Marchantia nepalensis, L. et L. Found in Mussoorie, near Dalhousie and at Lahore. In the first two places fertile plants were met with bearing ripe fruits, but in Lahore, ripe fruits are never borne, though male and female plants are common in March. In this species also the thallus has a definite mycorrhizal region in the midrib.

Marchantia polymorpha, L. Found in Pangie.

Dumortiera hirsuta, (Sw.) R. Bl. Nees. Found at Mussoorie, Chamba-

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Chuari Road, and Chamba-Pangie Road. Occurs usually under water or very near flowing water. In some specimens the male receptacles showed adventitious vegetative shoots usually from the posterior side. In one case a shoot was found growing from the anterior end of the male shoot below the receptacle.

Cryptomitrium himalayense, Kashyap. (New Phytologist, Vol. XIV, No. 1). The number of rhizoid furrows in the stalk of the female receptacle is always one in this species. Stephani states, that in the only other species of the genus, *C. tenerum* the number may be one or two. (Species hepaticarum, Vol. I, page 222). In this connection it is interesting to note that a specimen from Mussoorie in which the stalk had two perfectly normal female receptacles at the top and therefore had apparently bifurcated, the stalk had only a single furrow. The case of *Marchantia palmata* described above may, with advantage, be compared with this. Mussoorie, Simla.

Preissia commutata (Ldbg.) Nees, Pangie.

Wiesnerella denudata, (Mitten) St. Dalhousie—Chamba Road, a little above Khajiar.

Exormotheca tuberifera, Kashyap, (New Phytologist, Vol. XIII, No. 9) Mussoorie.

Conocephalum conicum (L.), Necker, Dalhousie—Chamba Road, above Khajiar.

Stephensoniella bevripedunculata, Kashyap, (New Phytologist, Vol. XIII, No. 9), Mussoorie; Garhwal near Gauri Kund. In one specimen the involucres were confluent dorsally.

Aitchisoniella himalayensis, Kashyap, (New Phytologist, Vol. XIII, Nos. 6 and 7, and note in Vol. XIV, No. 1, page 18), Mussoorie; very rare.

Targionia hypophylla L. var. *integerrima*, Kashyap, (New Phytologist, Vol. XIII, Nos. 6 and 7), Mussoorie; Garhwal common.

Cyathodium tuberosum, Kashyap. (New Phytologist, Vol. XIII, Nos. 6 and 7), Mussoorie.

Fimbriaria pathankotensis, Kashyap. n. sp. Monœcious. Male receptacle just behind the apex on main frond; female receptacle on very small ventral shoots. Closely creeping, in dense green patches. Thallus once or twice forked up to 2 c. m. long; lobes linear or linear oblong up to 8 mm. long and 2 mm. broad. Dorsal surface green, flat or slightly convex, margins wavy purple, stomata small bounded by 2 series of 6 cells each; air-chambers small many-layered empty. Ventral surface purple, midrib convex gradually passing into the wings; scales overlapping purple, exceeding the margins, appendage long linear entire. Antheridial papillæ small purple. Stalk of female receptacle up to 5 mm. long paleaceous at the top. Receptacle flat with high stomata and one or two involucres; perianth hyaline or reddish, $\frac{2}{3}$ exerted, ovate. Capsule: elaters unispiral or partly bispiral brown, up to 175u, generally less, sometimes branched; spores opaque, brown broadly reticulate, wing finely punctale; 90u. Pathankot, on the side of a pond.

Fimbriaria Blumeana, Nees. Mussoorie. Monœcious, antheridia on a cushion behind the stalk which is terminal on the main frond.

Fimbriaria angusta, St. (Species hepaticarum, Vol. I, page 91). Mussoorie. Diœcious. A curious abnormality was met with in a plant of this species similar to the one described and figured by Solms-Laubach in *Exormotheca pustulosa*. (Bot. Zeitung, Bd. 55,1897). In the latter he has figured a receptacle with two lateral involucres containing archegonia and one dorsal involucre containing a ripe sporogonium. In the present species the usual number of sporogonia is 4 or 5 and they are normally arranged on the under surface of the receptacle. In one specimen, however, it was found that there were four sporogonia each in its perianth and arranged normally and a fifth

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sporogonium contained in its own perianth and dorsal involucre and directed straight upwards. There was a slit on one side of this dorsal involucre but it was closed below. It appears that the involucre was originally lateral, but was later carried upwards by basal growth.

This plant is very xerophilous occurring on bare exposed rocks in large dense patches.

Fimbriaria Mussuriensis, Kashyap. Monœcious, both male and female receptacles on short ventral shoots.

Thallus green unbranched long narrow, linear oblong, with ventral and occasionally apical adventitious shoots up to 10 mm. long and 2 mm. broad, closely creeping. Dorsal surface green flat stomata bounded by 3 series of 6 cells each; chambers empty. Ventral surface greenish or reddish; midrib flat gradually passing into the wings; scales hyaline or reddish, appendage reddish linear entire. Male and female shoots irregularly mixed or alternating or male on one side and female on the other side of the frond. Antheridia in a hemispherical cushion, papillæ small. Stalk 10 mm. long sparsely paleaceous at the base and the whole length but densely so at the apex. Receptacle flat or slightly convex 2-4 lobed; stomata high, perianth conical, lanceolate, $\frac{2}{3}$ projecting. Elaters bispiral up to 200u, long, sometimes branched. Spores opaque, margin entire, up to 100u.

The apex of the frond bends down into the soil at the end of the season and grows up again next year producing a characteristic bend.

Moist shady places, Mussoorie.

Grimaldia indica, St. n. sp. Monœcious, thallus closely creeping, unbranched or once or twice forked, lobes long narrow, more or less parallel, up to 1·5 c.m. long and 2 mm. broad. Dorsal surface green flat or slightly concave; margins purple, stomate distinct, with three series of 7-8 cells each; Chambers densely filled with filaments. Ventral surface convex with a rounded midrib; scales purple, overlapping, not exceeding the margins, lunate, entire; appendage rarely hyaline linear-lanceolate, curved, entire, sometimes two appendages to each scale. Antheridia in a median dorsal elliptical to linear-oblong red cushion; papilla purple conspicuous. Female receptacle always on very short ventral shoots, four or five of which may be found on each side of the main frond. Stalk up to 2 c.ms. long, slender, naked; receptacle convex, involucres up to 4; capsule slightly projecting beyond the circular mouth of the involucre; operculum large brown 1 mm. in diameter; basal cells of capsule wall 75×20u, annulus cells 30×30u, operculum cells thick—walled 60×50u. Elaters closely trispiral, about 250u; spores brown spherical 90u, with large round papillæ appearing as lobes along the margin.

The plant was sent by the writer to Professor Stephani who named it.

Occurs in Mussoorie, Pathankote, rarely in Lahore in winter along the river bank.

Reboulia hemispherica, (L) Raddi. Mussoorie, Dalhousie, Simla.

Plagiochasma appendiculatum, L. et. L. (New Phytologist, Vol. XIII, No. 9). The stomata were described by the writer as bounded by 3 series of 8 cells each. Material from different localities has shown that the number of cells in each series varies between 6 and 8. Garhwal very common; Lahore, rare.

Plagiochasma articulatum, Kashyap. (New Phytologist, Vol. XIII, No. 9). Garhwal, common, Simla; Lahore, rare.

Mindal pangiensis, Kashyap. Gen. et. sp. nov. (after Mindal temple in Pangie).

Monœcious or diœcious. Thallus in dense tufts of dark green colour, plants often overlapping, $1\frac{1}{2}$ c.m. or more long, two or three times forked, multiplying by apical adventitious shoots, lobes oblong notched at the apex,

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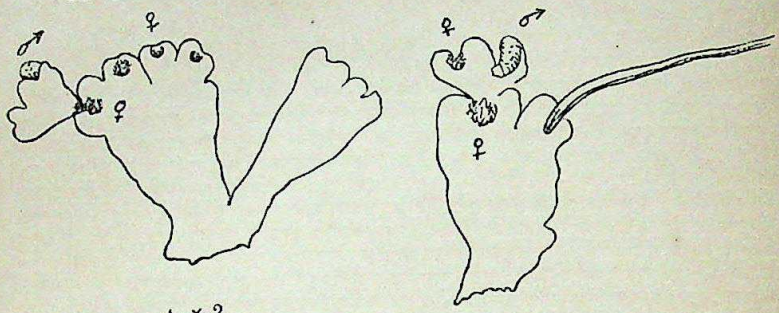
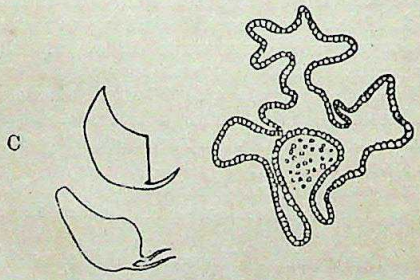
5 mm. long 2½ mm. broad. Dorsal surface green; air chambers in several layers empty; stomata conspicuous simple bounded by 2-3 rings of eight cells each: margins crenate, purple, turned upwards. Ventral surface purple, midrib gradually thinning away towards the margins; scales purple, overlapping, reaching to less than half way to the margin, broad, lunate,



A × 2 B × 4

Fig. 1.—A and B.—*Mindal pangiensis.*

margin entire, with one or two long linear appendages; a few colourless cells are met with in the body of the scales. Male receptacle terminal or marginal, disc shaped, circular or notched anteriorly separated from the main thallus by a groove laterally or posteriorly as well; surrounded by linear red scales; papillæ inconspicuous with simple inconspicuous stomata between them; antheridia oval. Growth is occasionally continued in front of the male receptacle by an apical adventitious shoot, but this shoot remains very small. Female receptacle terminal, hemispherical and surrounded by numerous linear scales when young. If unfertilised growth is practically always continued by an apical adventitious shoot, but if any archegonium is fertilised



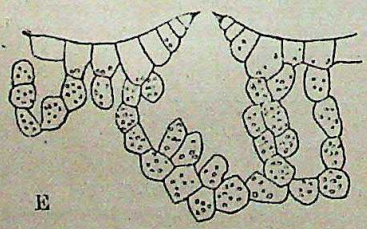


Fig. 2.

Mindal pangiensis.

C—Two scales × 16.
D—T. S. of stalk of carpocephalum × 150.
E—T. S. of thallus (a portion) × 320.

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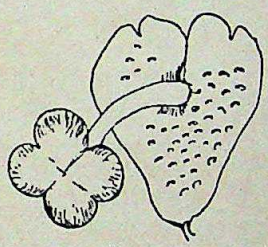
it stops. Stalk up to 2½ c. m. s. with one rhizoid furrow containing tuberculate rhizoids, angular (due probably to the decay of the softer inner tissue as only dry and old specimens were available), also greatly twisted when dry; scales present at base and apex. Receptacle and capsule seen only in small pieces and in an unsatisfactory condition. Receptacle small, involucre one or two. Sporogonium one in each: foot small, seta a mere constriction, capsule-wall of thinwalled cells; elaters closely trispiral, 180u, yellow; spores-reticulate lamellate, 30u, yellowish.

The plant has affinities with *Reboulia* and *Plagiochasma*. Found in Pangie; quite common; 8,000 ft.

Sauchia spongiosa, Kashyap. Gen. et sp. nov. (After Sauch Pass near which it was found). Monœcious. Plants occur singly or in small patches, with numerous adventitious shoots from the ventral surface just within the margins. Thallus spongy, light green, thick, once or twice forked, occasionally in rosettes; lobes broad oblong 5-10 mm. × 4 mm., apex notched rather deeply, margins entire, or slightly toothed, slightly raised. Dorsal surface areolated, flat or with a narrow, shallow indistinct median groove in the posterior part; air-chambers wide and deep, empty, in one layer, directed forwards obliquely; stomata simple, slightly raised, surrounded by 3 series of 8 cells each, innermost cells usually collapsed; circular when young, drawn out when old. In the oldest parts the stomata become disorganised and the chambers open by the whole width and are visible to the naked eye. Cells all thin-walled. Ventral surface greenish, midrib thick; scales



× 3

Fig. 3.—*Sauchia spongiosa* × 3.

scattered, hyaline, small, triangular, proximal half of thin walled cells gradually passing into the thick walled distal half; the young scales have capitate mucilage cells projecting from the margins. Antheridia oblong cylindrical, 3 mm. long scattered on the dorsal surface of the lobes, especially of those which enclose the female receptacles; papillae inconspicuous. Female receptacle in a fork formed by two lobes (cf. *Exormotheca*); Stalk 7 mm. long in unripe specimens, with one rhizoid furrow containing a few tuberculate rhizoids, naked at base, but paleaceous at top; scales lanceolate with thin-walled proximal and a decidedly thick-walled distal half sharply marked off; receptacle 4 lobed, with 4 bivalved or slightly tubular involucres (lower wall of tube incomplete); stomata none, receptacle tissue absent; involucre walls with large chambers opening by irregular fissures inwards; archegonia one in each involucre. Sporogonia when young with a well-developed foot.

Habitat.—Moist shady rocks on the Chamba-Pangie road, 10,000 feet.

The plant is a connecting link between the *Astroporeæ* of Leitgeb and the *Exormotheca* line.

Athalamia pinguis, Falconer. (New Phytologist, Vol. XIV, No. 1) Mussoorie.

Athalamia dioica, Kashyap. n. sp. Diœcious. Thallus thick fleshy green,

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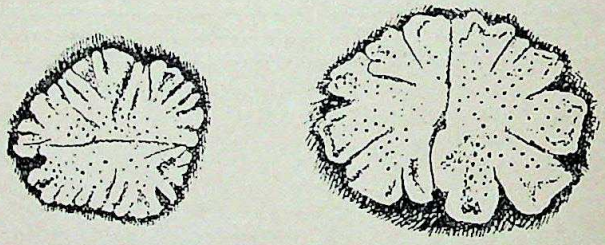
once or twice forked, lobes oblong, up to 3/4 c.m. long and a little less broad. Dorsal surface with a white metallic lustre; stomata having 5 or 6 cells with thick radial walls; cells of epidermis thin walled; air-chambers rather wider than those of A. pinguis. Scales triangular or ovate, acuminate, produced into a filament of a few cells. Capsule only slightly exerted, elaters brown, rather closely trispiral, 200-250u, spores deep brown with numerous high conical papillæ, 50-55u. Antheridia in 2-4 zigzag or straight rows in the mid-dorsal line on a definite raised naked receptacle.

Habitat.—Common in Pangie, 8,000 ft.

Gollaniella pusilla, St. (New Phytologist, Vol. xiv. No. 1). Garhwal, common.

Riccia (*Ricciella*) *robusta*, Kashyap. n. sp.

Monœcious. Thallus very spongy of a yellowish green colour, forming rosettes up to 1½ c.m. in diameter, sometimes plants are small and overlapping; lobes spreading up to 2 mm. broad. Dorsal surface, flat, the margins often turned upwards, especially before dichotomy, often with a fairly broad median groove; occasionally in closely creeping plants, the margins are firmly bent; air-chambers large opening by large indefinite pores, the large pits on the posterior part being quite visible to the naked eye. Ventral surface greenish, midrib strongly projecting; scale none;



A × 2. B × 2.

Fig. 4.—A. B.—*Riccia robusta* × 2.

rhizoids both tubercular and smooth. Antheridial papilla not distinct. Sporogonia project ventrally. Spores completely reticulate,—lamellate with a broad toothed wing 80u., 4 reticulations in the diameter, opaque when ripe.

Habitat.—Lahore, Shalamar garden, common in the cracks between the bricks of the floor of the walks in winter, occasionally on the Ravi banks; was also seen at Banda. The presence of antheridia is doubtful. A large number of plants were dissected but no papilla were ever observed and only once structures which looked like antheridia were seen. The possibility of parthenogenesis should be kept in mind. The plant will be investigated later on.

Riccia (*Ricciella*) *Cruciata*, Kashyap. n. sp.

Monœcious. Thallus yellowish green, spongy, thin, delicate usually twice forked, with diverging lobes thus forming as a rule cruciform rosettes. Rosettes about 1 c.m. in diameter, lobes obovate-oblong with a shallow, narrow mid-dorsal groove. Transverse section oblong, both surfaces almost flat. Scales small, delicate, deciduous, often only as small oblique ridges or absent Rhizoids chiefly smooth, a few tuberculate. Antheridia globular papillæ inconspicuous. Sporogonia projecting ventrally. Spores tetrahedral, completely reticulate, 60u.

Habitat.—Common in some cultivated places as the Lawrence garden in Lahore; occasionally on the Ravi banks; also seen at Banda on the banks of the Ken. Found in winter.

Riccia pathankotensis, Kashyap. n. sp. Monœcious. Plants overlapping

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in dense patches, occasionally singly and spreading when in open space. Thallus once or twice forked, compact, light green, up to 5 mm. long. Lobes oblong obtuse 2 mm. long and 2 mm. broad. Transverse section oblong. Dorsal surface with a broad median channel. Ventral surface hyaline or blackish, broad, flat, or slightly convex. Wings thick. Cilia usually present on the margins and occasionally also on the dorsal surface. Epidermal cells spherical. Scales small and hyaline, almost overlapping, not projecting beyond the margins. Rhizoids both tuberculate and smooth. Antheridia globular or slightly elliptic; papillæ slightly projecting, hyaline, in 2 or 3 rows in the channel. Sporogonia also in the channel in 2 or 3 rows with very little vegetative tissue between them, visible dorsally. As many as six capsules were sometimes found in one group touching each other without any green tissue between them, the small amount which was probably present in the beginning having been disorganised. Spores tetrahedral, reticulate with eight areoles in the diameter, papillose in profile, margin slightly and irregularly crenate, 95u.

Allied to *R. bifurca* and *R. lescuriania*.

Habitat.—On the banks of a stream near Pathankot.

Riccia himalayensis, St. n. sp. Diœcious. Plants once or twice forked, compact, closely creeping, about 5 mm. long. Lobes linear or oblong. Dorsal surface green with a deep narrow median sulcus. Ventral surface purple, midrib convex projecting downwards. Margins often purple, entire, bent downwards. Scales small, semilunar, distant, purple or hyaline; rhizoids both smooth and tuberculate. Sporogonia in a single median row, spore coming out by the rupture of the dorsal tissue. Spores tetrahedral, finely reticulate, 9-10 reticulations in the diameter, margin narrow, entire, maximum diameter 100u. Antheridia in one median row, papillæ long red, projecting, conspicuous.

This species is probably identical with *R. discolor* L. et L. The plant was sent by the writer to Professor Stephani and named by him.

Habitat.—Mussoorie, very common; Pathankot; Garhwal, common.

The apex at the end of the season grows down into the soil and becomes thick. Next year it again grows upwards.

The plant is attacked by an ascomycetous fungus which forms sunken perithecia with projecting necks on the dorsal surface. These perithecia are easily mistaken for sporogonia, but the latter do not project in *Riccia*. The perithecia are full of asci each containing 2-celled spores. The fungus appears to belong to the Valsaceæ.

Riccia sanguinea, Kashyap n. sp.

Diœcious. Male plants minute, red, linear, undivided, or once or twice forked, or forming red or greenish rosettes always smaller than female plants; papillæ red conspicuous. Female plants usually green in large compact rosettes often overlapping in dense clusters. Rosettes up to

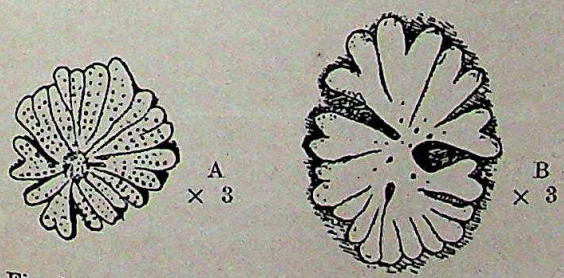

Fig. 5.—*Riccia sanguinea* × 3. A. male; B. female.

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1½ c.m. in diameter. Lobes linear oblong to obovate-oblong parallel, closely attached to the substratum. Dorsal surface flat or slightly convex, occasionally with a narrow middorsal groove. Ventral surface convex. Transverse section elliptic or semi-circular; midrib gradually passing into the margins, wings practically absent. Thallus compact. Scales absent. Rhizoids only smooth, rarely a few with faint tubercles. Antheridia oblong cylindrical in one or two rows. Archegonia indicated in the young state sometimes by a red spot on the dorsal side, neck not projecting outwards. Sporogonia in one median row on each lobe, distant, dehiscing by the rupture of the dorsal tissue. Spores opaque tetrahedral, 50u., granular or with very close, irregular, almost wavy streaks.

Habitat.—Extremely common on the banks of the Ravi in Lahore. Also found at Banda on the banks of the Ken. Of the three species of *Riccia* found in Lahore, it is the first to appear in the beginning of winter and the last to disappear, lasting from about September to about April.

A comparative study of the species of the genus *Riccia* described above confirms the view as to the origin of forms like *Riccia* from some *Targionia*—like ancestor, expressed by the writer in the New Phytologist (Vol. XIII, No. 9, page 317, and Vol. XIV, No. 1, page 1). *Riccia pathankotensis* is especially interesting in this connection. In deriving this genus from some *Targionia*-like form we should have the continued growth of the thallus forward, so that the involucre becomes dorsal and later on the gradual elimination of the involucre itself. An illustration of the first step we find in the genus *Cyathodium* (Lang; The morphology of Cyathodium. Annals of Botany, 1905). In most species of this genus the involucre is ventral and the archegonia apparently on the ventral surface which, however, is really the dorsal surface. In *C. cavernarum*, the archegonia lie actually on the dorsal surface. The next step would be a little further growth of the thallus and reduction of the involucre so that the archegonia would then lie in a broad channel as is actually the case in *Riccia pathankotensis* and some other species. *Targionia* has already developed vegetative tissue between its antheridia. *Riccia* has gone further and formed it between the archegonia as well. According to this view those species which have no trace of a dorsal channel would be the most reduced, *e.g.*, *R. sanguinea*. This is confirmed by the absence of scales and tuberculate rhizoids in this last species. At the same time the structure of the thallus of the species put in the section *Ricciella* resembles that of the thallus of *Cotsinia*, &c., and it is possible therefore that the genus *Riccia* has really originated from two different sources.

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MEMBERS OF THE SOCIETY IN THE ROLL OF HONOUR.

The Society has to deplore the loss of one of its keenest and most distinguished members in the death of Major C. H. T. Whitehead, 56th Rifles F. F., who was killed on 25th September 1915 while serving with the New Army in France in a battalion of his old regiment the Highland Light Infantry. Lt.-Col. Magrath writes to us as follows:—"Whitehead's death hit me hard. We were such fast friends and both so intimately associated in our joint hobby of the ornithology of N. W. India and to its zoology generally. It was in the beginning of 1905 that I first met Whitehead and I remember my delight, as a beginner in ornithology, in finding one, quite as enthusiastic as myself, and with a much greater knowledge. To me Whitehead was an ideal 'bird man' hard as nails, active, plucky, full of enthusiasm, tremendously painstaking and with a keen scientific mind. His vision, hearing and powers of observation were extremely acute, and it was rare that a preliminary identification was not endorsed by his gun or glasses. At the same time he was a true Sportsman and Nature Lover, and while not allowing sentiment to interfere with science, never developed into that soulless creature the collector pure and simple. To one of similar tastes he was a delightful companion in the field and one of the pleasantest recollections of my life is our joint expedition to the Kurram Valley in 1907. We also enjoyed together many ornithological rambles and investigations combined with shooting trips in Kohat, Bannu, Peshawar and elsewhere. Whitehead was never much addicting to writing papers or notes for the various Natural History Magazines to which he subscribed and occasionally I had to urge him to do so and give his observations and discoveries. He was always chary of seeing anything in print under his name unless it embodied matter of scientific value and the evidence for which had been thoroughly sifted. From the year 1905 to 1911 we kept up a steady correspondence and his letters were always (no matter on what subject, though they were of course mostly devoted to those concerning our hobby) of great interest, and many were quite worth publication.

Of course, as Adjutant, and later when working for the Staff College, duty sadly interferred with his hobby and he had little or no time for indulgence. To the work of others in the same line as his hobby, Whitehead always gave generous recognition and of his own work was correspondingly modest. His first venture into print was I think the short paper in the *Ibis* concerning the birds observed in the vicinity of a blockhouse he was holding on a railway line in S. Africa during the Boer War. His most important paper however was that published in the same Journal on the Birds of Kohat

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and Kurram in which I had the honour of collaborating with him to a small extent and which was republished in this Journal. Besides the abovementioned paper, Whitehead contributed a large number of valuable and interesting notes and papers to this Journal which have greatly added to our knowledge of the Avifauna of the N.-W. Frontier and Central India.

Many original discoveries were placed to Whitehead's credit. He first obtained the eggs of *Phylliscopus subvirides* and *Saxicola capistrata* and found a new race of *Anorthura neglecta*, which he did me the great and undeserved honour of naming after me. To the Avifauna of British India he added the Waxing and the Chaffinch and discovered a new Thrush *Oreocincla whiteheadi*. He shed fresh light on the distribution and nesting habits of many of our winter bird visitors and found the nesting place of the Chinese Reed Warbler besides making a large number of observations and accumulating a vast amount of information on migration of birds in the N.-W. Frontier Province.

His additions to the Indian Fauna were not confined to Ornithology alone and the discovery of a new Indian Stoat will always be associated with his name. He also added to our list of Mammals a dormouse, not previously recorded further east than Persia.

In the region of sport Whitehead was a good shikari and had some fine trophies of bison and tiger from the C. P., while at polo he was a good rider and constant player.

A smart and capable soldier in his own profession, Whitehead held the Adjutancy of his Regiment for 4 years. When War broke out he was about to enter the Staff College, but was then retained for service in England with Kitchener's Army and appointed to command a Company in the 10th Battalion of the Highland Light Infantry with the temporary rank of Major. He met his death, like the gallant soldier he was, on the parapet of a German trench while leading his Company.

India has lost one of her best working Naturalists and one who will be hard to replace."

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MISCELLANEOUS NOTES.

No. I.—MONKEYS (*MACACUS RHESUS*) SWIMMING.

In parts of the Banda district long narrow stagnant pools, whose steep sides are fringed with bushes and small trees, occur commonly in the otherwise dry riverbeds. These pools are beloved of the red monkeys. Once in the course of a stroll I and another, aided by a dog, cut off the retreat of a troup of these monkeys and pinned them to the bank of one of these pools. Unable for fear of the dog to make their way through the bushes on the bank they retreated into such trees as there were. Wishing to see how they would attempt to extricate themselves from their dilemma we began pelting them with pebbles. They decided that this was more than they could stand, and one after the other jumped into the water and swam to the far side, where they sat in the sun to dry and relieved their feelings by explaining what they thought of us. The interesting thing was the height from which most of them jumped into the water. Either with the idea of avoiding us or of getting as far across the pool as possible each monkey climbed out as far as he could before he jumped. This meant that several had to jump a good fifteen feet into the water. The bushes made so thick a screen that it was difficult to get a clear view of the monkeys as they jumped. So far as I could see, they reached the water neither upright, as when dropping to the ground from the end of a branch, nor on all fours. Their bodies seemed to make an angle of about sixty degrees with the surface of the water which their hind legs struck first. The force of the fall carried them well below the surface but they soon reappeared and swam strongly dog fashion to the other side. I was unable to see whether they jumped from the branches or let themselves drop. "Muggers" are common in these pools but they get such a plentiful diet of corpses that they never seem to bother much about living beings.

MAYO COLLEGE, AJMER,
15th September 1915.

G. B. F. MUIR, I.C.S.

No. II.—NOTES ON THE HABITS OF THE HARLEQUIN BAT (*SCOTOMANES ORNATUS*).

A common bat here, Kurseong 4,750 elevation, appears shortly after sundown. Flight slow and direct but not very heavy, flies generally about 20 to 30 feet off the ground but often when in search of insects under trees comes very low. Have killed three with a badminton bat lashed to a light bamboo 6 feet long. Have never yet had one come into the bungalow though *H. harpegia* often does.

FOOD.

Stomachs examined contained a fine pulp of various insects, chiefly gnats and small moths with a sprinkling of beetle elytra, some of a bright green beetle, but I do not think any but small beetles are eaten. As the biggest bit of elytra is about the size of a pin's head it is very difficult to say what size the beetle might have been before it met the bat. When an insect has been swooped down on and caught, the bat flies on slowly with the muzzle pointed earthwards and if within 20 feet of one, one can distinctly hear it eating, the sound I would hardly call crunching but it is exactly like cutting through raw meat with a pair of small scissors. When wounded, alarmed, chasing or being chased by one of its own species, this species utters a shrill grating squeak, repeated once or twice, or not, according to

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the rage or fright or delight or all three combined that the bat feels. It is certainly a noisy bat and it takes little to make it squeak. The breeding has not been observed, nor the roosting places; I think it roosts in holes in tree trunks. Colour: males are darker coloured altogether than females.

C. PRIMROSE.

KURSEONG, 13*th September* 1915.

No. III.—THE PAINTED BAT (*KERIVOULA PICTA*, PALL) IN TIRHUT.

Though I have now been collecting many kinds of creatures in this District over a period of a number of years, it is only lately that I have seen this species. Some days ago my brother H. A. Inglis whilst hunting for moths in some scrub jungle caught a specimen of this bat in his net and kindly sent it to me. A few days later whilst staying with him we came across a few others in the same jungle but failed to catch any. The specimen caught was not as bright as those I have seen in Assam.

CHAS M. INGLIS.

LAHERIA SARAI, 8*th August* 1915.

No. IV.—NATIVE SCALPED BY A SLOTH BEAR (*MELURSUS LABIATUS*).

As the following case of a man having had his scalp taken off by a bear may interest the readers of the Journal, I give below the following details:—

A fortnight ago when up in Mount Abu I heard of the man, a Tâk by caste, and went to the Adam's Memorial Hospital to see him. He appeared to be well on the way to recovery and although tottering on his feet from having been long in bed was able to move about.

It appeared that the man who lives at the village of "Uria," some 4 miles north of the Cantonment, was proceeding on the morning of August 26th to take some grain to his fellow villager tending cattle 4½ miles still further along the Range, when in crossing a dry nullah a she-bear and her two half-grown cubs rushed out and mauled him, leaving the man face downwards and insensible. He was found by his fellow villager just after he regained consciousness and carried on a charpoy to the Adam's Hospital.

I append below the Assistant Surgeon's Report on his injuries which has come to hand this day:—

"....

(*a*) A lacerated wound below the left eye-brow just about a hair-breadth above the eye ball which narrowly escaped being injured.

(*b*) A large lacerated wound about 6″ × 8″ over and behind the right shoulder deep into the muscles which with the edges of the wound and skin were much torn and showed a ragged appearance.

(*c*) The whole of the scalp cap was missing. The bones of the skull were quite exposed as though scraped with a knife. Shreds of scalp were hanging round the head over the forehead and neck, and although these were cleaned, replaced and sutured, still a circular space of about 6 to 8 inches in diameter was left bare and exposed.

17th September 1915.—The wound over the eye has completely healed up.

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The wound over the shoulder is clean and filling up and is evidently in a healthy state.

The scalp wound.—As a large portion of the bone is without its covering (periasteum) some doubt exists as to its ultimately being covered up. Some healthy granulations have however sprung up from under the remaining portions of the scalp which are creeping up from several points over the bare skull, and some hope therefore is entertained of the patient's ultimate recovery, but at the present stage it is hard to tell.

The patient is to-day (15th September) much stronger, walking about and in the enjoyment of good health.

Whether the whole of the skull will eventually get covered up or not is yet to be seen, but I am more hopeful to-day than I have ever been since his admission."

The day following that on which the accident happened Captain Collins of the West Kent Territorial Regiment, now stationed at Mount Abu, went out to the place to try and find the obnoxious family but only succeeded in finding the unfortunate man's scalp (quite dry) still lying in the nullah.

The late Colonel Richard Irving Dodge of the United States Army in his interesting book, "Hunting grounds of the Great West," cites many cases in which men scalped by Indians have completely recovered and on page 399 he says, "Scalping is not fatal. I have known several persons alive and in good health who had undergone the process."

R. H. HEATH.

SABARMATI,
24*th September* 1915.

No. V.—ALTITUDE TO WHICH ELEPHANTS ASCEND.

I am able to confirm the late Mr. Tinne's note on this subject, quoted by Mr. Shebbeare in your last Number Vol. XXIII, p. 770. In August 1886 I made a trip with Mr. Prestage from Darjeeling up the Rishilah or Rechila with the object of finding a shorter and better route into the Chumbi Valley. For some miles the only path that then existed was made by wild elephants, and our camp below the summit at about 9,000 feet, was disturbed in the night by a herd. On the top at about 10,400 feet, the sheep which we had taken with us for food was killed by a tiger, and this is the highest elevation I know of on record for tigers. But I was assured by my friend, the late Mr. C. B. Clarke, F.R.S., that on one of his botanical expeditions into Eastern Sikkim, he had seen elephants' tracks in the snow at about 12,000 feet, which must have been made by elephants coming from British Bhutan over or round the shoulder of the Richilah.

H. J. ELWES.

COLESBORNE, ENGLAND,
26*th June* 1915.

No. VI.—CHASE OF CHINKARA BUCK (*GAZELLA BENNETTI*) BY ANOTHER.

I recently had a good chance of watching the chase of one chinkara buck by another. It was in April in the Banda district. I was strolling out early alone in the hope of chancing on a blue bull. It was as yet barely light and I heard the noise of galloping hoofs some time before I saw the animals. When I saw them first, they were coming in my direction. I stood still and they passed me at full speed within thirty yards. The leader

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was a chinkara buck of average size, while his pursuer was darker and seemed to me to be of unusually sturdy build and to carry horns well above the average. The leader carried on southwards for four or five hundred yards and then swinging round in a big curve again passed quite close to me, this time in a northerly direction and again swung round and repassed me. And so it went on for some minutes. The smaller buck closely followed by the larger kept galloping in a large figure of eight and I happened to be just at the waist of the figure. Once the animals passed me at a distance of not more than fifteen yards, but neither of them took the slightest notice of me. I did not see any does about but I suppose that marital jealousy must have been at the bottom of the bigger buck's rage. He was certainly feeling very savage and was snorting with indignation. Most of the time he was content to keep his distance, but every now and then a curve would give him the chance of creeping up closer, upon which he would put in a sudden spurt redoubling his ferocious snorts. But the smaller buck was always able to respond and keep out of reach. In the end the larger buck dropped further and further behind and finally gave up and slowed into a trot. The smaller buck carried straight on in the southerly direction in which he was then moving. The larger followed him more slowly and so both the animals disappeared. I do not know how long the chase had been going before I arrived, but the pair must have covered a good four miles while I watched, and I was surprised that the pursuer's resentment persisted for so long. I cannot explain to myself why the leading buck stuck to his figure of eight. The scene of the chase was an open piece of ground. On on side lay bare fields, but on three sides at no great distance there was open scrub jungle which, one would have thought, offered the best chance of giving a pursuer the slip.

G. B. F. MUIR, I. C. S.

MAYO COLLEGE, AJMER,
14th September 1915.

No. VII.—ON THE BREEDING HABITS OF THE LARGER *FELIDÆ*.

I append a note on the breeding habits of the larger *Felidæ*. The nature of the enquiry contained in this note is indicated by the manner of its conception. Dr. Marshall, who is a very old friend of mine and is perhaps the best known authority on the subject of the Physiology of Reproduction in animals, was interested in certain observations of my own on the subject. These observations are extremely limited and at his instigation I have undertaken to collect information with a view to piecing together as far as possible the whole story. Records of personal experiences of any of your readers which have a bearing on the subject will be gratefully accepted by the undersigned and in the event of publication, will be acknowledged.

In his book on Physiology of Reproduction Dr. Marshall writes :—

"Little is known definitely regarding the breeding habits of the larger *Felidæ* in their wild state, beyond the fact that they probably agree in having a single annual sexual season. In captivity certain of them, at any rate, are polyœstrous. Thus, in the lioness œstrus has been known to recur at intervals of three weeks until the animal became pregnant, while the period of œstrus may itself last a week."

Though the occurrence of a succession of 'heat' periods if pregnancy does not occur, is a matter difficult to determine of the dangerous *Felidæ* in the wild state, it can hardly be doubted that a mass of interesting information on the breeding habits of these animals is available in the experience of those who have devoted their time to shikar in this country.

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Reliable information can only be obtained from the personal experience of the individual and the whole story put together by the collation of these individual experiences.

Personal experiences bearing on the following heads will therefore be acceptable :—

(1) Period of 'heat'—the dates when the female is observed to be on heat.
(2) Dates of birth of young.
(3) Number of young at birth (or number of embryos carried.)
(4) Number of young reared.
(5) Duration of the period of lactation.
(6) The association of male with female, pairing season and duration, till birth of young or later.

It seems highly improbable that the date of coition and birth of young will be known for any particular individual in a state of nature. The period of gestation therefore will be obtained only from a comparison (1) and (2). The nature of the oestrous cycle too, whether monoestrous or polyœstrous, will only be determined by the seasonal length of (1).

It is known that in many cases climatic and environment changes appreciably modify the breeding season and it is therefore quite possible that the seasons may vary in different localities. A note of the locality is therefore desirable.

NAWABGANJ, CAWNPORE,
13*th October* 1915.

H. M. LEAKE,
(Economic Botanist to Govt. W. P.).

No. VIII.—OCCURRENCE OF *CHELIDORHYNX HYPOXANTHUM*, THE YELLOW-BELLIED FLYCATCHER, NEAR AMBALA, PUNJAB.

On January the 30th I shot a specimen of the above species within 3 miles of Ambala Cantonments. It was hawking insects from a mulberry tree in a mango tope. Its actions much resembled those of *Hemichelidon sibirica* for which I mistook it till I had it in my hand.

A. E. JONES.

SIMLA, *September* 1915.

No. IX.—DISTRIBUTION OF *EMBERIZA LEUCOCEPHALA*, THE PINE-BUNTING.

The distribution of this bird is given in the "Fauna", Birds, Volume II, page 255, as :—"A winter visitor to Gilgit, Kashmir and the Himalayas down to Garhwal. At this season the Pine-Bunting is also found in Afghanistan and Europe, but in summer it is confined to Northern Asia". In the Journal B. N. H. S., Volume XXIII, page 153, Mr. Hugh Whistler records this species being obtained in the Jhelum district. On 12th February 1911 I obtained two specimens of this bird, both males, one adult and one immature, from a small flock feeding on rice stubble at Lahore. Again during the early months of 1914 and 1915 I often came across these birds near Ambala. From the above it would appear to be a common, though local, winter migrant to the plains of the Punjab.

A. E. JONES.

SIMLA, *September* 1915.

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X.—*GYPS TENUIROSTRIS* (HODGSON), THE HIMALAYAN LONGBILLED VULTURE, BREEDING NEAR AMBALA, PUNJAB.

Last December I came across a pair of vultures quite new to me. They were building their nest which was placed in the topmost fork of a Peepul (*Ficus religiosa*) tree. Both birds were bringing sticks for the nest which at this time was merely a broad platform. This was on December the 20th. Five weeks later I again visited this locality and on approaching the tree saw that the bird was sitting. Sending my man up, the sitting bird having meanwhile departed, he, my man, announced an egg which I told him to leave and get out of the tree as I was anxious to shoot the bird and so put the identity of the egg beyond question. However, before he had time to descend any distance I saw the bird returning (it was raining at the time) and as it came within range I dropped her after which I ordered my man to bring the egg down. This measures m.m. 83·3 by 67. It is a dull greyish white and unmarked. In shape it is a broad oval. The texture of the surface of the shell is much coarser than is exhibited in those I have of *Pseudogyps bengalensis*, many of which were breeding in the surrounding jungle, and at this time 24th January, had well grown young ones.

I now made a close examination of the bird which was without any doubt *Gyps tenuirostris* (Hodgson).

The following points were particularly noted: (*a*) It had absolutely no vestige of down on the head; (*b*) Its length from tip of upper mandible to end of tail was 38½ inches; (*c*) It had 13 retrices so that one was missing (it fell 200 yards away lodging in a bush in dense *dhak* jungle, and my man from his coign of advantage was able to direct me straight to it). The missing feather may have been dislodged in the act of dragging it back to the tree in which the nest was built, for I could find no trace of a stump. Height of nest from ground, 44 feet. Materials: foundation of dead sticks on which the true nest of boughs and twigs with the dried leaves still adhering to them was built. The whole closely resembling the nursery of *P. bengalensis* except that it was much more massive and the depression in which the egg rested was much deeper.

The following week I hunted up the country within a radius of five miles but saw no more of this species.

SIMLA, *September* 1915. A. E. JONES.

No. XI.—KITE AND KINGFISHER.

While I was fishing in the Sarju near Bageswar in the Almora district one of the big pied hill kingfishers, *Ceryle lugubris*, came flying down the centre of the stream about twelve feet above the water carrying a fair-sized fish. A kite, *Milvus govinda*, wheeling near, saw it and made a sudden stoop at it. While the kite was still several feet distant, the kingfisher dropped the fish and flew on down stream. The kite made no attempt to catch the fish before it fell into the water, but swung off and flew away on some other quest. One often sees kites trying to rob each other, but this was the only occasion on which I have seen one trying to rob a kingfisher. It struck me as curious that the kite should attempt a manœuvre which apparently even when successful could bring no profit. Possibly the kite calculated on getting closer to the kingfisher before the latter dropped the fish. I have also wondered whether the kingfisher realised that it would rid itself of the kite's pursuit, if it dropped the fish, or whether it dropped it merely to lighten itself for quicker flight.

MAYO COLLEGE, AJMER, G. B. F. MUIR, I.C.S.
15*th September* 1915.

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No. XII.—A FURTHER NOTE ON THE BREEDING OF THE HOBBY (*FALCO SUBBUTEO*) NEAR SIMLA, N. W. HIMALAYAS.

Last year I recorded finding a nest of this species containing three young (J.B.N.H.S., Volume XXIII, pages 579-581). On June the 27th of this year I again found them in the same locality. Soon after first sighting them one disappeared through the trees and I carefully noted the direction. On approaching the spot I found the nest and put the male off. Sending my climber up he announced three eggs so I shot this bird. The female approached but gave no chance of a shot. Telling the man to bring the nest and eggs down, I tried to stalk the female but she was too wary and flew away down the *khud*.

The nest was on the outskirts of a deodar forest placed 65 feet up a deodar (*Cedrus deodara*) at an elevation of 6,000 feet. The nest was undoubtedly built by crows (*C. macrorhynchus*) but the hobbies had added a "fence" of thorny twigs round the brim. The lining was fine rootlets, hair, grass and small pieces of twine. A few of the hobbies' feathers adhered to the nest. The eggs were slightly incubated. Two eggs are of a dull salmon-pink ground, evenly and finely speckled with liver red and some blotches of the same shade sparsely distributed over the surface. The third egg is a uniform bright brick red with a few indistinct blotches of a deeper shade collected at the larger end.

The gizzard of the male contained portions of a bird.

A. E. JONES.

SIMLA, *September* 1915.

No. XIII.—NOTES ON CUCKOOS IN MAYMYO.

The hill-station of Maymyo is situated on an undulating, forest-clad, plateau at an elevation of about 3,500 feet above sea level. The forest growth consists largely of oaks and chestnuts and a good deal of it is second growth jungle.

The parasitic cuckoos are particularly well represented and obtrusive, especially in the neighbourhood of the station.

There are five common species and one less common. In addition to these, two other species were observed on one or two occasions only, so they were probably only stragglers.

1. *Cuculus canorus.*—The Cuckoo. This well-known English bird is very common round Maymyo, where it may be heard calling from the third week in March to the middle of June. They seem to deposit their eggs chiefly in the nests of *Anthus rufulus* (the Indian Pipit) and *Pratincola caprata* (the Pied Bush-chat), both very common in Maymyo.

I found three eggs this season which I attribute to this cuckoo.

The first was found in my garden on May 3rd in the nest of the Pied Bush-chat, together with four eggs of the latter, all quite fresh.

This egg is ovo-elliptical in shape, with no gloss, and in colour a pale starling blue, almost unspotted, but on close examination a few very faint spots can be made out. It measures 0·96″ × 0·70″. In spite of the colour I believe this egg to belong to *C. canorus* which was frequently to be seen and heard in my garden.

The only other cuckoo, *viz.*, *C. micropterus*, to which it might be thought to belong, must be ruled out, as it is practically non-existent in Maymyo.

The second egg, quite a different type, was found on May 4th in a nest of *Megalurus palustris* (the Striated Marsh Warbler) with two eggs of the latter, all hard set. It is oval in shape, very slightly glossy and measures

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0·91″×0·63″. In colour the ground is, where visible, a very pale greenish white spotted all over but more especially towards the big end with rufous and some underlying pale purplish grey markings.

The third, similar in colour to the last, was found broken in a nest of *Meloptus melanicterus* (the Crested Bunting).

I heard of several cases of the eggs of this cuckoo being found in the nests of the Indian Pipit but was not fortunate enough to find any myself.

2. *Cuculus micropterus.*—The Indian Cuckoo. Heard the well-known musical call of this bird ("make more Pekoe") only twice. It is evidently only an accidental visitor in Maymyo.

3. *Cuculus poliocephalus.*—The Small Cuckoo. This species has not, I believe, previously been recorded from Burma. I heard its unmistakable call on the 26th April. It was evidently only on migration as I did not hear it again. Doubtless it will be found to breed in the hills north of Burma.

4. *Hierococcyx sparverioides*—The Large Hawk-Cuckoo. This species is both common and noisy in the forest round Maymyo, but is rarely heard in the station. It is chiefly heard between the middle of April and middle of May.

It has, like *H. varius*, two distinct calls. The first, or "Brain fever" call, is very similar to that of *H. varius* but is much less crescendo.

The second call is also somewhat similar to the second call of *H. varius*, but instead of being in an ascending followed by a descending scale, as is the case with *H. varius*, the notes are repeated with scarcely any rise or fall. Two eggs of this hawk-cuckoo were found on May 15th in nests of *Garrulax moniliger* within 200 yards or so of each other. This was in open scrub jungle, one of the nests being placed in a bramble bush not more than 4 feet from the ground and the other in a chestnut sapling just within reach of the hand.

The first nest was rather a "surprise packet." It contained :—

3 young *Garrulax moniliger*, just hatched.
2 young *Coccystes coromandus*, one about four days old and one about two days only.
1 egg of *Coccystes coromandus*, incubated.
1 egg of *Hierococcyx sparverioides*, addled.

The last egg is of a rather pale "hedge-sparrow" blue, glossless, and of a fine texture. It measures 1·13″×0·80″.

The other egg of *H. sparverioides* was in a nest containing four eggs of the Laughing Thrush, all of which were fresh.

It is similar in all respects to the last described and measures 1·10″× 0·86″.

I think it probable they were both laid by the same bird.

These eggs agree well with those found by my brother, A. E. Osmaston, near Naini Tal in the nests of *Trochalopterum erythrocephalum* and described in this Journal, Vol. XXI, page 1330.

It is interesting to note that the breeding season of *H. sparverioides* is different in these two localities to fit in with the different breeding seasons of the host birds, *viz.*, May for *Garrulax* in Maymyo and July-August for *Trochalopterum* in Naini Tal.

5. *Coccystes coromandus.*—The Red-winged Crested Cuckoo. This handsome bird, which is so rare in India, is common round Maymyo. It is a shy bird with a somewhat Jay-like rasping note.

The eggs are laid in the nests of *Garrulax pectoralis* and *moniliger*, especially the latter, and usually two or more eggs of this cuckoo are laid in one and the same nest.

The eggs are very broad ovals, fine in texture and without gloss. In colour they are rather pale hedge-sparrow blue.

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They can be at once recognised from the eggs of the host, which they resemble in colour, by their shape and absence of gloss.

The eggs, found in six nests, measured as follows :—

15th May	1·02″ × 0·88″	Associated with two young *C. coromandus.* with 3 young *Garrulax* and one egg of *H. sparverioides.*
18th May	1·05″ × 0·91″ 1·12″ × 0 98″	with 5 *Garrulax* eggs.
Do.	1·10″ × 0·96″ 1·13″ × 0·94″	with 2 ,, ,,
21st May	1·07″ × 0·93″	with 2 ,, ,,
8th June	1·12″ × 0·94″ 1·02″ × 0·89″	with 3 ,, ,,
17th June	1·14″ × 0·98″ 0·98″ × 0·87″	with 2 ,, ,,

It will be noticed that in three cases out of four where two cuckoos' eggs were found in the same nest, the eggs were of quite different sizes. Is it possible that the two different sized eggs give rise to birds of different sexes ?

The first nest, found in May 15, was visited at intervals in order to ascertain the fate of the young *Garrulax*.

On May 17 the two young *Coccystes* were found to be flourishing and to have grown a lot; of the three young *Garrulax*, one was dead (under the cuckoos in the nest), a second was dying and the third was alive but evidently starving and had not grown at all.

On May 21st the young *Garrulax* had all disappeared.

On May 23rd one young cuckoo had flown and the other was with difficulty secured as it made off.

I took the latter home and brought him up on a diet of grass-hoppers, cockroaches, caterpillars, and beetle larvæ, and he remained loose in the garden for over three months, when he was probably killed by a cat. He was quite tame and would fly down on to my hand to be fed. He never really learnt to feed himself.

His plumage was at first rufous with pale bars. He developed a crest at about five weeks old and moulted gradually into his mature plumage at three months old. He was very fond of caterpillars hairy or otherwise, and it was interesting to watch his method of dealing with them.

Having seized the caterpillar he passed it through his beak until he had hold of it close to the head when he proceeded to cut through the neck with a side to side motion of one mandible over the other. Having nearly severed the head he passed the caterpillar through his bill until he had it by the posterior extremity, which he treated in a similar manner.

The unfortunate caterpillar was now reduced to the condition of a tube open at both ends. The cuckoo then took it by the head or neck and flicked it violently from side to side so that all the contents of the stomach, etc., were quickly expelled. He did this very thoroughly, repeating the operation several times, holding the caterpillar usually by the anterior but sometimes also by the posterior end. Finally the almost empty skin of the caterpillar was gulped down.

The dexterity with which he dealt with caterpillars was remarkable, especially when it is borne in mind that he was never taught. The action was, no doubt, hereditary and instinctive.

6. *Cocomantis merulinus.*—The Burmese Plaintive Cuckoo. This cuckoo, which is very common in and around Maymyo, takes the place in Burma of its congener, *C. passerinus*, in India.

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Like the latter it has two distinct calls. The first is almost exactly like one of the two calls of *C. passerinus* and consists of three notes, the first and third the same, the second about a tone lower, repeated three times, each repetition being a little higher in the scale than the preceding.

The second call of *C. merulinus* is entirely different to that of *C. passerinus*. The call of the latter, well expressed by the word "ka-veèr....," repeated several times, in a slightly descending scale, is peculiar to that species.

The alternative call of *C. merulinus*, on the other hand, is a single note repeated about four times at half second intervals followed by a rapidly accelerating vibratory note, somewhat resembling in its intervals the settling down of a bouncing ping-pong ball. It is possible that these two very distinct calls in the case of the two species of *Cacomantis* are each confined to one sex, but I have been unable to prove this. *C. merulinus* begins to call in April and continues throughout May and June. The last bird I heard calling was on July 24. They are shy and difficult to observe but very noisy and persistent in calling both by night and by day. Both calls are heard in the day time, but at night the second only.

Five eggs of this cuckoo were taken, two by Major Pollard and three by myself, all in the nests of *Franklinia gracilis*, a very common bird here.

It is probable that the nests of *Franklinia rufescens* (a rarer species) and of *Orthotomus* are also patronized by this cuckoo.

The eggs are oval with a slight tendency to ellipticity, fairly glossy and measure respectively 0·77″ × 0·51″, 0·76″ × 0·53″, 0·71″ × 0·50″, 0·70″ × 0·51″, and 0·70″ × 0·50″.

The ground colour of the egg is either pure white or *Zosterops* blue, lightly spotted with pale chestnut or rufous especially at the large end where the spots tend to form a fairly dense zone. In fact, except for size, they are very fair imitations of the different types of *Franklinia* eggs. The eggs were taken between May 20 and July 15. They were in each case associated with 3 eggs of *Franklinia*, and as four is the normal full complement of the latter it is probable that one egg of the wren-warbler is removed by the cuckoo when she deposits her own.

7. *Surniculus lugubris*.—The Drongo Cuckoo.

This bird is not very common around Maymyo, and it is superficially so like a king crow that it would generally escape detection if it were not for its characteristic call and which may be heard occasionally in the forest between April and June.

The usual call is a series of 5 or 6 notes in a regular ascending scale. It has another call resembling somewhat the alternative call of *Hierococcyx varius*, but in a much shriller key.

I failed to find the eggs of this cuckoo, which, however, are probably deposited in the nests of *Dicrurus cineraceus*, the common forest king-crow in these parts.

8. *Endynamis honorata*.—The Koel.

This bird is exceedingly common in and around Maymyo from April to June but seems to disappear altogether in July, probably descending to the plains.

Its note is too well-known to need description.

There are two species of crow found in Maymyo, viz., *C. insolens* and *C. macrorhynchus*. Other species of *Corvidæ* which are common are *Urocissa occipitalis*, *Dendrocitta rufa* and *himalayensis* and *Garrulus leucotis*.

I found no eggs of the koël but on May 2nd a nest of *Urocissa occipitalis* examined was found to contain three fully fledged young koels!

What had become of the eggs or young of the Magpie I am unable to say. Two of the three young koels were in black, and one in mottled plumage. I am unaware if young koels have been previously recorded in

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both these phases of plumage. All three young birds were unmistakably koels.

Unidentified species.

An egg found in June 5 in a nest of *Pyctorhis sinensis*, with two eggs of the latter, is somewhat elliptical, with little gloss and measures 0-80″ × 0-58″. The ground colour is a very pale pink, with pinkish spots or mottlings all over but especially at the big end and very few darker spots or streaks.

I am inclined to attribute this egg to a *Chrysococcyx*, probably *C. xanthorhynchus* but I did not observe this bird.

MAYMYO, *September* 1915. B. B. OSMASTON, I.F.S.

No. XIV.—CURIOUS HABITS OF WOOD-PECKERS IN THE KUMAON HILLS.

Those who know the hill forests of Garhwal may have noticed at one time or another rows of small neat holes made in lines across the stems of trees. They may be seen at any height up to at least 30 feet from the ground and the rows are nearly always quite horizontal. Each row consists of perhaps a dozen holes, half an inch or so apart, and the rows may be any distance down to a few inches one above the other. Often the distance apart is repeated with remarkable accuracy and in this case the rows are not separated as a rule by more than 6 to 8 inches. The holes themselves are more or less rounded and about ¼ to ⅓ inch across in section and they invariably pierce through the bark to at least half its thickness, but never in any circumstances enter the woody tissue beneath.

For the last few years I have been endeavouring to discover what it is that forms these holes and why they are formed. A general answer to the first question is fairly easily given. The holes are undoubtedly formed by wood-peckers. The species of wood-pecker responsible for this work of art and what his objective may be are questions not so easily disposed of.

If these holes be examined it will be found that they only occasionally show signs of recent attack. In by far the majority of cases the holes have been made some months or years previously and do not show any obvious signs of having been tampered with since. Such holes may extend only half way through the bark, but more frequently they extend right down to the delicate cambium layer separating the cortical from the woody tissue. Again, some of them will be found empty whilst others will contain a core of secondary growth tissue which may have completely filled up the lower half of the original cavity. This tissue is usually soft and spongy and sometimes tinged green. Where no such core of secondary tissue is present the bottom of the hole may contain a soft fungal growth which is usually white.

In some cases, however, the holes show signs of a recent visit. This is recognised by evidence of a fresh incision into the secondary growth tissue at the base of the cavity.

The species of tree attacked in the above manner are fairly numerous, but some trees are attacked very much more than others whilst some again are probably never attacked. The following are the trees most frequently found attacked in Garhwal:—

Ilex dipyrena.
Litsæa umbrosa.
Cornus macrophylla.
Pyrus pashia.
Prunus padus.

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Others not so extensively yet fairly frequently found attacked are:—

Quercus semecarpifolia.
Quercus dilatata.
Alnus nepalensis.

whilst the following have also occasionally been found attacked:—

Cornus oblongum.
Pinus longifolia.
Acer pictum.
Acer villosum.
Æsculus indica.
Machilus duthei.
Quercus incana.
Taxus baccata.
Corylus colurna.
Fraxinus floribunda.
Ulmus wallichiana.
Abies webbiana.

The elevation at which these attacked trees are usually found is 6,500′ to 7,500′, but I have also found them at 10,000′ and they probably occur down to about 6,000′.

The effect of the attack on some species is rather curious and striking. For example with *Ilex dipyrena* the formation of woody tissue is much stimulated just at the base of the cavities and after a number of years a woody horizontal ridge is formed beneath the bark which is sometimes raised as much as an inch above the normal surface of the wood. In such cases the bark cracks in a line passing through the original cavities which in a few more years may become indistinguishable. In *Quercus dilatata* also the cavities gradually run together to form a gaping crack which does not appear to heal over. However, in the majority of species the attack does not appear to have any effect on the growth of the tree. Trees attacked in the above manner may be found throughout the hills at suitable elevations though they are most commonly found in the central hill tracts.

According to Blanford the wood-peckers found at a suitable elevation in this tract of country are:—

1. *Gecinus squamatus*, West Himalayan Scaly-bellied Green Wood-pecker.
2. *Gecinus striolatus*, Little Scaly-bellied Green Wood-pecker.
3. *Gecinus occipitalis*, Black-naped Green Wood-pecker.
4. *Gecinus chlorolophus*, Small Himalayan Yellow-naped Wood-pecker.
5. *Chrysophlegma flavinucha*, Large Yellow-naped Wood-pecker.
6. *Hypopicus hyperythrus*, Rufous-bellied Pied Wood-pecker.
7. *Dendrocopus himalayensis*, Western Himalayan Pied Wood-pecker.
8. *Dendrocopus auriceps*, Brown-fronted Pied Wood-pecker.

Now of these we may safely neglect numbers 2, 4 and 5 as not sufficiently common to be responsible for the attacks we are investigating. The remaining five species cannot be so easily disposed of. In the forests where I have chiefly seen trees attacked I should place them in the following order of prevalence:—

Hypopicus hyperythrus, Rufous-bellied Pied Wood-pecker.
Dendrocopus himalayensis, Western Himalayan Pied Wood-pecker.
Dendrocopus auriceps, Brown-fronted Pied Wood-pecker.
Gecinus squamatus, Western Himalayan Scaly-bellied Green Wood-pecker.
Gecinus occipitalis, Black-naped Green Wood-pecker.

It is obvious that the attacks may be the work of any one or all of these birds, though I think it may be fairly argued that it is more likely to be the work of only one of the *genera* represented.

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I have so far absolutely no proof that any one species does make these holes or that any other does not. The bird however that I have seen most frequently in areas where the trees are much attacked is *Hypopicus hyperythrus* the Rufous-bellied Pied Wood-pecker, and this bird I have also watched systematically visiting the old lines of holes, thrusting his bill quickly two or three times into each cavity and working sometimes up, sometimes down the trunk. It is in fact my belief that *Hypopicus hyperythrus* is one, if not the only, perpetrator of these attacks though I admit that there is also much in favour of *Dendrocopus himalayensis* the Western Himalayan Pied Wood-pecker, and there is nothing to prove that the other three species do not assist.

To return now to the reason for these attacks. Why does the wood-pecker originally make these holes? Why does he make them almost invariably in such neat horizontal lines? and why does he visit them again as he most certainly does? These are some of the questions to be answered. It would be most natural to suppose that the holes are made in order to permit the bird to reach some insect, probably some noxious beetle attacking the cambium layer. This theory is, however, easily disposed of by a careful examination of a number of attacks on different species of trees. I have made many such examinations, but I have never once discovered any insect in the cavities, nor have I found anything to indicate that an insect had previously been living there beneath the bark. In fact I have found that the trees attacked are usually in perfect health and not the subjects of insect attack. It is necessary here to distinguish between the holes made in rows as described above and holes made haphazard all over the surface of the stem. In the latter case it will almost invariably be found that the tree is the subject of some insect attack or else that the stem is unsound.

The only other theory that has suggested itself to me is that the bird either sucks in the sap or actually eats the softer layers of the inner cortex and cambium. This theory is, I believe, the true one. It is however a theory which is obviously difficult to prove. One argument in its favour is the absence of any better theory. That the wood-pecker drinks the sap is not as improbable as it might at first appear. On one occasion I watched a female *Æthopyga* sp. repeatedly visit an old wound in an oak tree from which a sappy fluid was exuding. I was only a few yards distant and I could be quite certain she was drinking the sap. On another occasion I watched a male *Æthopyga horsfieldi* visiting again and again some rows of wood-pecker holes in a Karshu tree (*Quercus semecarpifolia*). The bird kept returning to this tree and I was able to watch it through my glasses from no great distance. It certainly appeared to me to be extracting sap from the bases of the cavities. So if sunbirds visit these holes to drink the sap they contain, there is no reason why wood-peckers should not do so. At the same time I think the wood-pecker probably also eats the inner soft layers of tissue, especially perhaps the secondary growth tissue which forms at the bases of old cavities. In confirmation of this, when examining an old attack on a Karshu tree at 10,000′ elevation where the bark had swollen up and cracked across the original line of holes, I found the crack contained soft new tissue in process of formation and a wood-pecker (or what I presume to have been a wood-pecker) had fairly recently attacked this in order apparently to eat it.

The reason why these holes are made in such neat rows is also difficult to understand. It seems possible that they are made in this manner merely because the bird finds it simplest to work round the stem in a horizontal line having once made a start at any point. The question, however, requires further investigation. I have never yet been fortunate enough to watch the process whereby the holes are originally made.

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It will be seen that my observations do not lead to any very definite result. At the same time it is considered worth recording them that others may assist in solving the problem. It would be interesting in the first place to know over what tracts of country this phenomenon occurs as this would probably assist in limiting the species of wood-pecker responsible.

NAINI TAL, *3rd October* 1915. A. E. OSMASTON.

No. XV.—PADDY-BIRDS (*ARDEOLA GRAYI*) FISHING.

I was pig-sticking one day in January near Fatehpur Sikri. We had our tiffin at the edge of a shallow tank, then full of water. A causeway ran out towards the centre of the tank. While eating tiffin I noticed a group of eight or nine paddy-birds apparently playing the game of King of the Castle. The coveted position was a stone slab which at a height of some three feet overhung the water at the end of the causeway. The bird in possession divided his time between gazing down intently into the water and turning round to drive away one of the others who from one side or another kept making repeated attempts to sidle up and share the stone. After some minutes of this I saw the bird in possession dive headlong into the water and emerge with a black object with which it flew to the edge of the tank, and there set to work to knock the life out of it and to eat it. The black object I took to be some kind of fish ; it was three or four inches in length, shiny black and appeared to be shaped something like a tadpole ; but I did not get a good view of it. Meanwhile another bird had taken possession of the stone and the old game was in progress. I forget whether any more captures were made, but I rather think that the next plunge was unsuccessful and that I then went round to investigate the attraction of the stone.

I found the edge of the stone cut into furrows by ropes, so that it was evident that it overhung a well sunk in the bed of the tank and now concealed by water ; but of the small black fishes I could for some time see no sign. Thinking my movements might have frightened them I took the paddy-birds' station on the stone and sat down to watch. Suddenly clouds of mud began to swirl up from under the surface, and a second or two later the water below the stone began fairly to boil with the small black fishes rising to the surface. They were not rising at anything but came up either for fun or for air or to escape some enemy below. After half a minute or so they ceased to rise and the water resumed its normal appearance. Some five minutes later a similar ebullition of the little fishes occurred and soon after I was called away.

I should very much like to know more about the little fishes and the reason of their queer uprisings, and of their (apparently) confining themselves to the well and perhaps someone will kindly enlighten me. But to me the really interesting thing was the behaviour of the paddy-birds. Of all birds in this country the paddy-bird appears the most stolid in temperament and the most machinelike in habits. And yet here was an instance of really surprising alertness in taking advantage of an opportunity which, if no novelty to those particular birds at the time of my visit, was certainly (at least so I believe), quite novel in relation to the race as a whole. Not only that, but a door is opened to interesting speculation as to what would happen if this novel opportunity chanced to become extended and common. At present chances of fishing in this peculiar manner must be much restricted in point both of time and locality. Tanks containing wells and peopled with these small fishes cannot be many and the season for fishing must be short, for wells would not be sunk except in tanks which dry up in the dry

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season. This tank in particular usually dries up before the end of the cold weather. But supposing such tanks with wells were multiplied over a considerable but compact area and were peopled with these small fishes and supposing that the water level rarely sunk below the mouths of the wells and that the fishes continued their peculiar ebullitions throughout the year, it might well happen that the paddy-birds of the area or a certain proportion of them would take to making their living mainly in this fashion and perhaps learn also to take fishes in kingfisher fashion under other conditions too. We might then be able to witness the birth of a new race. The paddy-bird, I imagine, while specialising on frogs, does not disdain to snap up a fish, should one come within its reach. But there is a great difference between this and taking fish in the way which I have described. In the one the bird hunts in shallow water and has its feet on Mother Earth in some form. To launch itself through the air at a prey swimming in deep water is quite another thing. Though the birds did not make as clean an entry as a kingfisher but took rather what at school we used to call "bellyfloppers," they did strike the water beak first in true kingfisher fashion. This method would operate on quite a different set of qualities both of form and function to those brought into prominence by the paddy-bird's usual method of shikar. And it can hardly be doubted that in the course of generations structural and nervous changes would follow upon the continued practice of the new method.

MAYO COLLEGE, AJMER, G. B. F. MUIR, I.C.S.
15*th September* 1915.

No. XVI.—FANTAIL SNIPE (*GALLINAGO CŒLESTIS*) BREEDING ON THE TEESTA RIVER.

Perhaps the following may be of interest to you and others:—To-day the Teesta River is in full flood and whilst I was out in a boat visiting different houses on the deeorah, I came across a piece of grass land that was all but submerged, and there flushed a snipe and saw 3 young ones. As the river was rising and the little bit of ground on which the birds were was quickly going under water, I got out of the boat and tried to catch the young ones that could not fly. I got one but unfortunately two ran into the water and were swept away before I could rescue them; the one I caught I am releasing this evening on the bank of one of the tanks here which has good feeding ground; and on which one finds many snipe in the cold weather. The little "batcha" is undoubtedly a "Fantail." There was only one parent bird with the young and I only saw three young ones. As I have not found snipe breeding here before I thought it might be of interest to you. I mentioned to a gentleman in June that I thought I had seen some snipe about and he ridiculed the idea, but now from finding this old one and three young ones I am sure that what I saw at a distance that day were snipe.

KAKINA, P. O. RUNGPUR, DIST. BENGAL, G. H. HODDING.
12*th August* 1915.

No. XVII.—EARLY ARRIVAL OF THE SHELDRAKE (*TADORNA CORNUTA*, LINN.) IN THE DARBHANGA DISTRICT, TIRHUT.

On the 28th of last month a mirshikar brought me a female sheldrake. It was in wonderfully good condition and was evidently not a wounded bird which had got left behind at the time of migration. A few teal have been noticed flying over for the last three weeks.

BAGHOWNIE FACTORY, LAHERIA SARIA, CHAS. M. INGLIS.
8*th August* 1915.

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No. XVIII.—BREEDING OF THE MARBLED TEAL (*MARMARONETTA ANGUSTIROSTRIS*) AND OTHER BIRDS AT SONMEANI, BALUCHISTAN.

Sonmeani is a coastal village of some importance about 50 miles from Karachi in the State of Las Beyla, Baluchistan. About the middle of May I sent my collector there prospecting for eggs, and on his return he informed me that he had seen appreciable numbers of Marbled Teal, as well as Shovellers and Garganeys, on a large jheel several miles in extent, in the vicinity of the village. He was also informed by the local people that a certain number of duck year after year hatched out their broods on the jheel. I sent him back to investigate matters and on his return on the 20th June, he brought me back eggs which from his description of the bird, coupled with the colouration, texture and size of the eggs I took to be those of the Marbled Teal.

To make sure, he was sent out once again to shoot a specimen for identification. He did better than this and brought in a pair of young Marbled Teal alive, which have been presented to the Karachi Zoo.

Two nests were found by him on the 14th June on his second visit, one with a clutch of 12 (incubated), the other with a clutch of 9 (unincubated). The nests were found on an island in the middle of the jheel, and were constructed within a thick tussock of grass completely shrouded from view. A grass tunnel track betrayed the mode of entry. The female when disturbed performed the broken wing trick.

My collector told me that he was informed that eggs of this bird were found annually and that when fresh they were generally taken and eaten. On his third visit he found several other nests containing broken egg shells, the young having hatched out.

He volunteered the remark that at least a dozen broods must have been hatched out on this jheel.

I give this account in some detail, because as far as I am aware the records of this bird breeding anywhere near Indian limits have only been reported twice, *viz.*:—

(i) Blanford records Captain Butler as having obtained eggs at first believed to be those of the Garganey, but subsequently referred to this species at Ormara on the Baluchistan Coast.

(ii) Mr. Aitken in the summer of 1913 records a brood of 14 ducklings of this species on the Khusdilkhan Lake near Quetta.

The Shovellers and Garganeys seen by my collector on his first visit were not seen subsequently.

Altogether Sonmeani appears to be a very interesting spot, as besides the eggs of the above species, the following were also brought in:—

Black Winged Stilt (*Himantopus candidus*)—Eggs taken May 20th.
Great Stone Plover (*Esacus recurvirostris*)—Eggs taken 12th June.
Caspian Tern (*Hydroprogne caspia*).
Gull-billed Tern (*Sterna anglica*).
Black Shafted Ternlet (*Sterna saundersi*).

Colonies of *H. caspia* and *S. anglica* were found breeding on a saltish maidan on June 13th. The nests were a mixture of earth and dry grass slightly raised above the general surface of the ground. Specimens of all these terns were shot and brought in for identification.

Spoonbill (*Platalea leucorodea*) 1 egg only obtained on the 8th July. According to Blanford this is very early.

White Ibis (*Ibis melanocephala*)—Eggs taken 8th July.

It is almost certain that either the large Indian Pratincole (*Glareola orientalis*) or the Collared Pratincole (*Glareola pratincola*), or both also breed at Sonmeani as my man saw them there at the end of May. He was unaware

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at the time of the subtle discrepancy between the two species, and as he had obtained several clutches of *G pratincola* with me at Jungshahi, Sind, at the commencement of the month he made no search for either eggs or young.

The Collared Pratincole seems to breed in the same place at Jungshahi year after year. I have, however, never seen this bird there in the cold weather months.

KARACHI, F. LUDLOW.
21*st July* 1915.

No. XIX.—A NOTE ON THE NIDIFICATION OF THE GREEN SHRIKE-TIT (*PTERUTHIUS XANTHOCHLORIS*).

As the nesting economy of this bird has apparently not been previously recorded it may be of interest to record particulars of a nest I found near Simla on June 12th, 1915. This nest was suspended from the angle where two slender horizontal twigs on the Wild Laurel bifurcated, and was 18 inches from the ground. The locality is well wooded and has abundant undergrowth. Elevation 8,000 feet.

Materials of the nest, which is a very flimsy structure, are green moss and very fine (hair-like) grass. This is smeared over with a fine layer of spiders' webs and then exteriorly decorated with flakes of lichen. The lining consists of black stems of the maiden-hair fern and fibrous grass. Suspension is effected by spiders' webs. It is a deep purse-shaped structure, but the edge where there is no suspension is much lower than where this has been effected.

Dimensions of the nest are:— Depth, exterior 4 inches by 2½ inches (this at the points where suspension ceases). Depth, interior 2¾ inches by 1¾ inches (also where suspension ceases).

There were two slightly incubated eggs in the nest. They are broad ovals very slightly pointed towards the small end. The ground colour is a pinky white, and is marked heavily at the large end, where they form an irregular zone, with deeper and lighter red brown and inky-purple or lilac blotches. The remainder of the surface is lightly blotched and speckled with the same colours.

Measurements of eggs—(*a*) 18.3 mm. by 14.5.
(*b*) 17.8 mm. by 14.

TATTERSALL HOUSE, SIMLA, A. E. JONES.
14*th October* 1915.

No. XX.—*PSEUDOGYPS BENGALENSIS*, THE WHITE-BACKED VULTURE BREEDING IN IMMATURE PLUMAGE.

Hume was of opinion (*vide* "Rough Notes," page 26) that the solitary nests of this species belonged to *young* birds. He, however, says nothing regarding the plumage of the owners of these nests, and I think it may safely be inferred that without exception they had assumed the adult dress. That this bird does breed in immature plumage I have proved on two occasions: (1) On November 17th, 1907.—In this instance there were two occupied nests in the tree, a Banyan. The lower one, only 15 ft. from the ground, was occupied by a bird in immature plumage and contained one egg, slightly marked and much soiled. The other nest in this tree was occupied by a fine mature specimen and also contained an egg, richly marked. (2) On December 20th, 1914.—A solitary nest, 36 ft. up a Peepul tree standing in fairly heavy "Dhak" jungle. The egg in this was

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unspotted but had a large patch of blood on it. To put the matter beyond doubt I shot this bird, which on examination proved undoubtedly to belong to the above species.

TATTERSALL HOUSE, SIMLA, A. E. JONES.
14*th October* 1915.

No. XXI.—NUMBER OF KOEL'S *(E. HONORATA)* EGGS FOUND IN ONE NEST.

It would be interesting to know what is the largest number of Koel's eggs found in any one nest of either of its foster-parents. The greatest number that has come under my observation was nine eggs of this species together with four of the foster-parent, *i.e., Corvus macrorhynchus*. Three female Koels had evidently deposited three eggs each, there being three distinct types. This was at Kanchrapara, near Calcutta, on the 7th of April 1907.

TATTERSALL HOUSE, SIMLA, A. E. JONES.
14*th October* 1915.

No. XXII.—CATCHING A COBRA WITH BARE HANDS.

On the 24th September 1915, a cobra about two feet long was observed in a yard in one of the enclosures of the Ghazipur Opium Factory. As snakes of this species are objects of special veneration to Hindus, the coolies employed in the vicinity did not attempt to kill it. The news of the discovery of a cobra in this somewhat unusual place filtered to another department of the Factory in which a man named Ghisan Komhar works. This man is an adept at catching snakes with his naked hands. He was soon on the spot and effected the capture in a few minutes without any apparatus of any kind. He approached the snake and seizing it by the end of the tail gave it a sudden jerk, and then lifted it up by the tail from the ground. The cobra was unable to twist round and bite him. He carried it away to his department and borrowed a penknife from the Assistant in charge and slipping his hand up the body of the snake forced open its jaws and broke its fangs. He then wrapped up the now harmless cobra in a piece of cloth and handed it over to his father who is a watchman, to keep until he could take it away. I saw the cobra a few minutes after its capture. It was alive and vigorous and full of fury. The moment the cloth was removed it erected itself and expanded its hood on which was very distinctly visible the characteristic pair of spectacles. It swayed about and struck viciously at its captor hitting him on his bare chest and on his fingers but never inflicting a bite. The capture was witnessed by Mr. Clarke, the Assistant in charge of the department in which the snake was found, and the operation of extracting the fangs was witnessed by Mr. Ward in whose department the snake-catcher works. I was unfortunately not present at these two interesting operations.

Some years ago Ghisan Komhar captured a cobra about four feet in length with his naked hands to my knowledge. This cobra had wounded a boy who inadvertently came near its hiding place but did not succeed in inflicting a proper bite. The boy recovered. The snake was in such a position that it could not raise its head to strike properly. Hence the boy's lucky escape.

Ghisan Komhar who lives in Mianpura, a ward of Ghazipur City, is an adept in the perilous art he practises, and has caught many cobras in the manner described above. He told me in reply to questions I put him that he would feed the little snake he had caught about once in eight days and that its food would be one or two small frogs or toads (Mendki) on each occasion.

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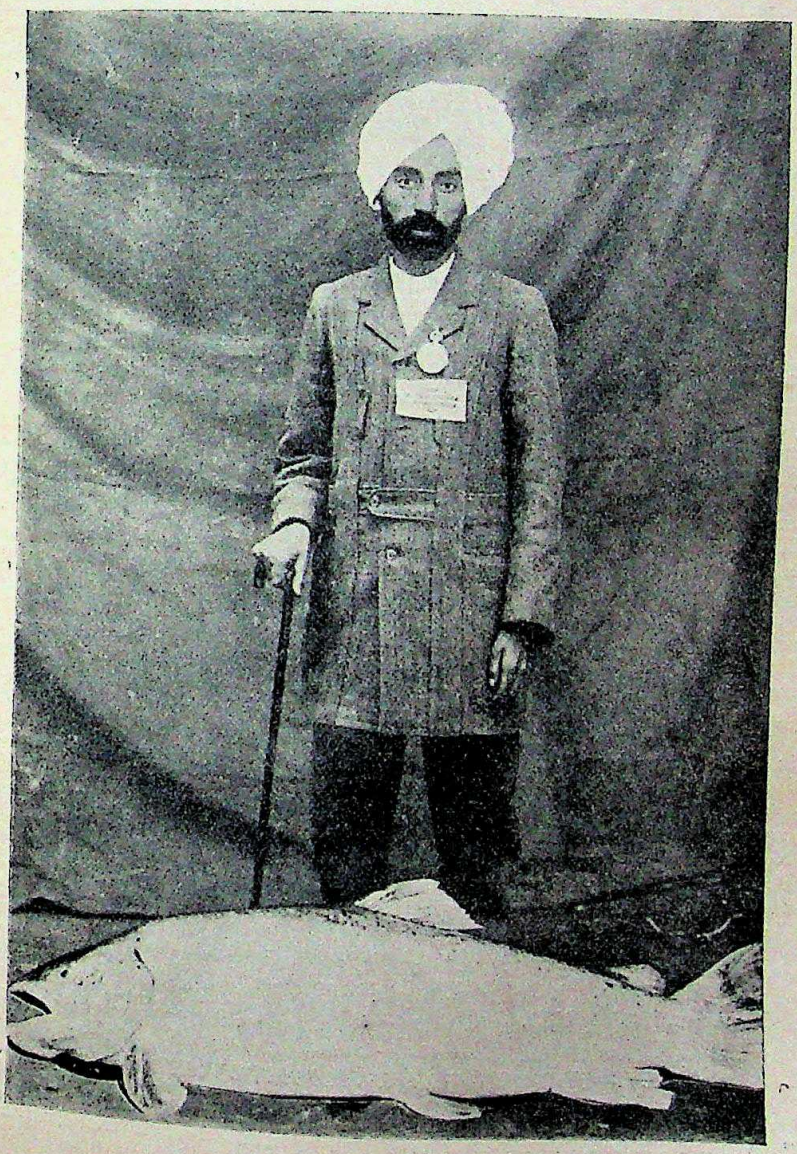
Ghisan's object in catching snakes is to supply snake-charmers who buy them off him.

GHAZIPUR, U. P., *25th September* 1915. G. A. LEVETT-YEATS.

No. XXIII.—LARGE KASHMIR BROWN TROUT, *SALMO FARIO.*

The fish represented in the photograph is the biggest *hen* fish we ever had in the ponds at Harwan near Srinagar, and when it died weighed, I think,



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16 lb. 1 oz. Probably it was the mother of some of the first ova that went to Kulu when trout were introduced into the Punjab from Kashmir. Pundit Sodhama, who is standing behind the fish is still in charge of the Hatcheries at Harwan and came to us in the end of 1900 when we got out our first ova from the Duke of Bedford. At that time he was suffering from consumption, but the fine air and life in the open cured him and he has turned out a most valuable man. I sent him with the first ova to Kulu, where at the time Mr. Howell was Assistant Commissioner, and the watch he is wearing in the photo was presented to him by the Punjab Government in recognition of his services there. He is a most willing and intelligent man who speaks no English, but is well read in Sanskrit and all fishermen who appreciate trout fishing in our hills should bear him in grateful memory for the good work he has done.

F. J. MITCHELL.

RAWALPINDI, 23*rd December* 1915.

No. XXIV.—NOTES ON THE OCCURRENCE OF *DANAIS HEGISIPPUS*, CRAM; *DANAIS DORIPPUS*, KLUG; AND *EUPLŒA MULCIBER*, TYP. & VAR. *KALINGA* FROM UNRECORDED LOCALITIES IN THE MADRAS PRESIDENCY.

(1) It may be of interest to many readers of the Natural History Society's Journal to learn that a ♀ of *Danais hegisippus* was captured at Rajahmundry in Godavari District on 14th October 1908, and a second specimen was seen a week after at Guntur. Prior to this, I believe this species has not been recorded from anywhere in the Madras Presidency. This specimen is on view at the Coimbatore Gass Museum.

(2) On the 3rd November 1913, a fine ♂ of *D. dorippus*, Klug, was captured at Amridi Plantation, 16 miles south-west of Vellore, North Arcot District; two days prior to this capture several ♀ specimens of *Hypolimnas misippus*, 2nd form, very closely resembling *D. dorippus* were captured very close to the locality where the above capture of *D. dorippus* was made. The specimen is with me at present; on first sight it was mistaken for a large ♀ of *H. misippus*, 2nd form, but its flight resembled the flight of *D. chrysippus*. I believe this is the first recorded occurrence of this dimorph in the Madras Presidency. I informed Mr. Hannyngton, I.C.S., of its capture and he had not heard any case of its previous occurrence in South India.

(3) Bingham does not record the occurrence of *Euplœa mulciber* anywhere in the Madras Presidency. In February 1898, several specimens were captured by me in the Rhamba Forest Reserve, Ganjam District.

(4) In October 1906 two ♂s of *Euplœa mulciber*, var. *kalinga*, were captured in the Bollapalli Forest Reserve in the Guntur District, and in November 1907 numerous ♂ and ♀ were captured at Maliavaram in the Godavari District, the former two were given to Mr. N. S. Brodie, I.C.S., and several of the latter several specimens are on view at the Coimbatore Gass Museum.

I think the above records, though belated, should find a place in the Society's Journal.

VELLORE, 1*st July* 1915. T. N. HEARSEY, I.F.S.

No. XXV.—NOTE ON *GERYDUS BOISDUVALI* (MOORE).

I find that there is little hope, so far, of any one finishing Volume III of "Fauna of British India, Butterflies," by Bingham. I shall therefore be

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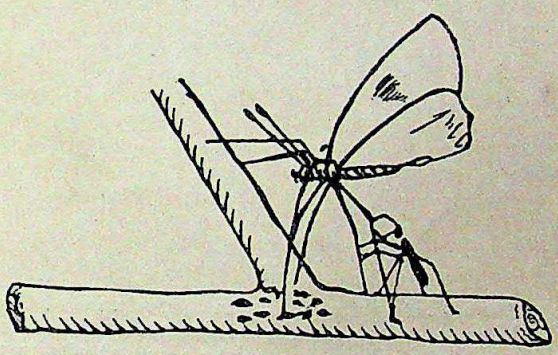
obliged if you will allow me to correct an error in Volume II, page 287. I ought to have done so years ago, but the late Colonel Bingham promised he would have it corrected in Volume III, but alas! he never lived to finish it.

At the end of August 1906, I sent him home a coloured sketch of the butterfly *Gerydus boisduvali*, Moore, shewing it standing on a branch, and in the act of tickling an aphis with its proboscis, and with a largish ant standing up and examining its legs with its antennæ. Colonel Bingham wrote in reply, (I have his letter before me at this moment) to say the butterfly was *Gerydus boisduvali*; and that he was inserting a part of my letter in Volume II which he was then working at. Upon his sending me a copy of this volume, I at once drew his attention to the error on page 287. The artist would seem to have lost my sketch and put the butterfly "*Allotinus horsfieldi*" in its place, and shewn it in the act of seizing some huge unknown bug with its fore legs. The humble *Gerydus* of my sketch may be seen on page 292 of same volume.

It is quite a small fly, but with legs of enormous length—possibly to enable it to escape attack by ants—also engaged in feeding on the honey exuded by the aphides.



This butterfly is exceedingly common in Maymyo, Burmah.

H. J. WALLER BARROW, Colonel.

19, Warwick Road, Ealing, W.,
19*th July* 1915.

No. XXVI.—AN AGGRESSIVE MIMIC OF THE RED TREE ANT.

Three mimics of the Red Tree Ant (*Oecophylla smaragnida*) have come within my observation—two spiders and one reduviid bug. Of the spiders the commoner one is in shape like *Synomosyna formica* figured by Poulton in his colours of animals and imitates the ant for protection. The other figured below mimics for the sake of feeding on the ants undetected. The habit of ants of carrying one of their dead comrades in the jaws, which is, I believe, within the observation of all, is utilized by the spider. Usually waiting in the fork of a twig or leaf just away from the general stream of ants, it pounces upon an ant when the opportunity occurs and soon has it in its jaws held much in the same position as the ants do. With one so held

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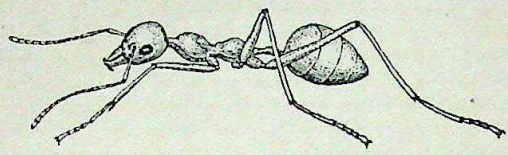
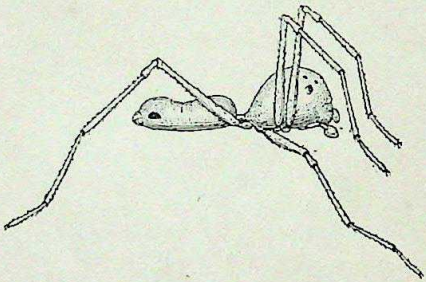
and with the colour of the spider imitating that of the ant to perfection, the different shape of the Cephalo-thorax is obscured from sight and the fraud is not discovered from the front. And behind, the shape of the abdomen with the two black spots on it for eyes, set at rest at once, the doubts of any inquisitive ant. When it is lying in wait or moving about the spider keeps constantly fluttering the first two pairs of legs.



Red Tree Ant.



Spider.

From the way the spider preys upon the ants, it is easily perceived that it is a coward. When one was put in a bottle along with three ants the spider appeared much terrified and fled on the approach of the ants which were on a vigorous search for an exit. But when these same ants were slightly pinched and put again in the bottle half dead, it was not long before one appeared in the jaws of the spider.

It is interesting to record that two black spots in the same portion on the body, but on the wings, were observed on the mimicking bug, but the only specimen that I ever got has been unfortunately lost.

K. KUNHIKANNAN, M.A.,
Senior Assistant Entomologist.

BANGALORE, *7th September* 1915.

No. XXVII.—SENSE OF LOCALITY IN A LEAF-CUTTING BEE.

Once in October in the Fatehgarh district I had to make a long round of villages and arranged to spend the middle of the day at the furthest village. On arrival I found that the villagers had put out two charpoys for me in a grove under the shade of a mango tree. The charpoys were placed parallel about six feet apart, and with their length running north and south. I seated myself on the east side of the east charpoy.

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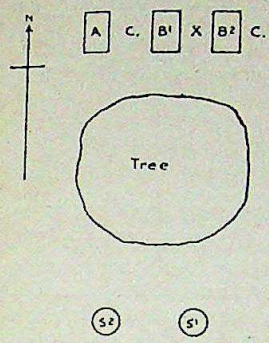

A = Western Charpoy.
B^1 = First position of Eastern Charpoy.
B^2 = Second position of same.
S^1 = First position of Sun.
S^2 = Later position of Sun.
X = Wasp's Hole.
C. C = Points about which casts were made by the wasp after the moving of Eastern Charpoy from B^1 to B^2.

After a few minutes I noticed a wasp (or bee ?) of the kind which looks like a tuft of orange velvet, fly up with a piece of green leaf and enter a hole in the ground about three feet to the east of the middle of the charpoy on which I was sitting. In a moment or two it emerged without the leaf and flew away. For the next hour or so I watched several similar visits of the insect. But, as the sun moved across the sky, my charpoy was thrown out of the shade and I had to move it following the shadow of the tree eastwards. In the new position the charpoy was about three feet to the east of the wasp's hole.

When the wasp in a few minutes time returned, instead of going to the hole, it flew to a point about three feet east of my charpoy in its new position (that is, to a point having the same bearing on the new position of the charpoy that the hole had on the first position of the charpoy) and proceeded to make a number of close casts, evidently searching for its hole. After about a minute of this the wasp rose into the air, flew over my charpoy and, passing very nearly above its hole, went on to the western charpoy, which had not been moved, and made one or two rather wild casts to the east of this charpoy also. It soon gave this up and returning by much the same line, began once more to make casts to the east of the charpoy on which I was sitting. It did not however persevere long but flew off, still carrying its piece of leaf and though I stayed on for the best part of another hour, I did not see the wasp again.

The wasp's behaviour seemed to me to show that it was not guided by some mysterious homing instinct, but took its bearings from some convenient object much as we do ourselves. When this object was moved without its knowledge, it was as completely thrown out as we should be, if a hill, on which we relied for direction, were moved, unknown to us, from the west to the east side of our objective.

It would have been interesting to know whether the wasp began work on the hole before or after the charpoys were put out on the grove. The former supposition seems the more probable; in that case the impression of the first set of bearings, taken on more distant objects such as the tree, must have been completely effaced by the stronger impression afterwards produced by the charpoy, looming large in the immediate vicinity of the hole.

With regard to the casts made by the wasp to the east of the western charpoy, I cannot definitely state that these were evidence of an attempt to apply to the western charpoy bearings which had given no result when applied to the eastern charpoy. The casts were too few, too hasty, too high to justify the definite adoption of this conclusion. Nevertheless the impression conveyed to me at the time was that the wasp was actuated by the

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idea of applying to the western charpoy the bearings which it had applied without success to the eastern one.

G. B. F. MUIR, I.C.S.

MAYO COLLEGE, AJMER,
15th September 1915.

No. XXVIII.—THE LIFE HISTORY OF CERTAIN INSECTS.

[In September last Mr. C. Beeson, the Forest Zoologist, Dehra Dun, wrote asking us to forward a letter, in which he asked for information on the life history of certain insects, to the reviewer of "Indian Forest Insects." This we did and it has been suggested that we might publish this letter on the chance that members might be able to assist Mr. Beeson in his enquiries—EDS.]

"In your review of Mr. Stebbing's book on "Indian Forest Insects" in the Journal of the Bombay Natural History Society, XXIII, No. 4, you refer to several points of considerable interest which indicate that you are in possession of information on some forest pest species, which this branch of the Forest Research Institute has not yet recorded.

I should consider it an act of great courtesy if you would favour me with any data that you may have on the species noted in the attached list. I am working at present on several of them and would be glad to have all the information now available, as to host-plants, distribution, seasonal occurrence, etc. I should naturally make full acknowledgment for all information received, when recording it in the specific ledger files, but at present do not immediately contemplate publishing any account of these particular species.

The number of workers on forest insects in India is lamentably small, and one therefore welcomes any additional evidence that will confirm or add to the knowledge of life histories."

LIST of species referred to in the Journal of the Bombay Natural History Society, XXIII. 4, pp. 763—767, now under investigation at Forest Research Institute, Dehra Dun.

Hepialidæ.

Phassus malabaricus. A serious pest of plantation teak in Burma, Assam and Madras Are other hosts known, and what is the life cycle in *Trema orientalis* in Bombay?

Phassus sp. Is the species in *Strobilanthes* known?

Cossidæ.

Duomitus ceramicus. There is no record of the hosts of this species in India. Information wanted on its association with figs.

Pyralidæ.

Pyrausta machæralis. No other hosts of this species except teak are recorded. It feeds on other Verbenaceæ its seasonal history in localities where teak comes into leaf late is cleared up. What hosts are known?

Chrysomelidæ.

Haltica sp. Is the identity of this species available?

Larinus sp. Ditto.

C. BEESON,
Forest Zoologist.

DEHRA DUN,
September 1915.

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No. XXIX.—ENTOMOLOGICAL NOTES FROM MESOPOTAMIA.

When I left Bombay last November, I had the foresight to enclose a folding butterfly-net and a few other necessaries for an entomologist in the limited amount of kit permitted to be taken on Field Service and these have occasionally come in very useful as I have been shifted from point to point in the extended field of operations. The following notes on the butterflies of Lower Mesopotamia will be of interest to some of the readers of the Journal. When one remembers what a fertile spot the valley of the Tigris and Euphrates has been in the past centuries, the number of species taken has been surprisingly and disappointingly small and this is probably due in part to the annual flooding of the country and the same character of the vegetation. Referring to my diary I am able to give the following list:—

Danais chrysippus ..	Three specimens taken in Basra, (November). Dhiramiyeh, (May) and Kerna, (May).
Junonia orithya ..	Shaiba, Kerna and Amarah, all the year round apparently.
Vanessa cardui ..	Shaiba, swarming in the Bjorjidiyeh wood, (March —May). Basra, (December).
Vanessa indica ..	Two specimens seen at Shaiba, (April).
Colias edusa ..	Ahwaz, (May). Amarah, July. Not uncommon.
Colias hyale ..	One female taken Amarah, (July).
Pieris brassicæ ..	Very common in Basra, (December).
Pieris ? ..	Closely resembles *P. rapæ*. Two specimens taken at Amarah, (July).
Teracolus fausta ..	Not uncommon in Basra and Kerna, (November —December).
Polyommatus bœticus.	Basra, (November). Amarah, (July).
Catochrysops strabo..	Amarah, (July). Not uncommon.
Zizera lysimon ..	Kerna, (January—February). Shaiba, (March —April). Amarah, (July). Very common.
Zizera gaika ? ..	Amarah, (July). Two specimens.
Tarucus theophrastus.	Amarah. Not uncommon.
Hesperid ..	A common Indian species whose name has slipped my memory.

The one surprise was *Colias*, all of which were taken on small patches of lucerne at river level which at Amarah is not much above sea-level. Only a narrow margin of vegetation borders the rivers on either side and beyond this barren desert stretches away to the horizon. At Amarah the hills are some sixty miles off and at Ahwaz snow ranges can be seen at a greater distance.

Of other families of Insecta, perhaps, the best represented are the *Odonata* which, of course, would be suspected in a country subjected to inundation. I have taken several interesting species of these. *Coleoptera* and *Rhynchota* are not in evidence but I have seen more species of *Blattidæ* here than I have noticed in India. At Shaiba well out in the desert I took two species of *Mantis* which are new to me. One species is common, of the other I only found one specimen and it is evidently as rare as it is inte-resting. I found it on the most barren desert, its upper surface rounded, brownish in colour and altogether resembling a pebble or piece of dry mud. When disturbed, it reared itself on to its terminal abdominal segments, two long spikes assisting in this by forming a tripod with the tip of the anal segment as third leg. The under-surface is pure white in striking contrast to the upper. The wings are purely rudimentary and not adapted for flying and at the time of rearing the body in the erect position, these are spread

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widely to reveal two very striking black and yellow pupil-like markings on their under surfaces. The whole aspect is like that of an owl's face and is evidently intended to frighten off the all too-common lizard. At intervals the wings are vibrated rapidly and produce a rustling noise which reminded me of the characteristic rustling made by the *Echis carinatas* scales. I managed to obtain a photograph of the insect standing on defence and this when enlarged will give a very good idea of what I have described. On the whole the fauna of this country closely resembles that of Lower Sind; bird life and animal life are interesting, especially the former, but I have not sufficient technical knowledge to give a list of their names. I have bottled a few lizards, one or more species of which, I am in hopes, will be new and which I shall endeavour to send to the B. N. H. Society.

J. C. FRASER, CAPT., I.M.S., M.D., F.E.S.

AMARAH, *July* 1915.

No. XXX.—OCCURRENCE OF *HIMANTOPTERUS CAUDATUS*, MOORE, ON THE BABABUDIN HILLS.

I believe it would interest systematists of Heterocera, especially those working at some of the obscure and little known families, to note that in June last while on a holiday collection trip to the Bababudin Hills, I happened to come across this lovely little *Zygaenid* moth. Specimens of these were collected on two days in succession in broad day light during the afternoon, each afternoon, being followed by a smart shower of rain in the evening. The exact locality where I got them is Hirakkanmett Estate at an elevation of 4,700 feet. On both occasions the insects were found flying together in companies of eight and nine among bushes in a thickly wooded and cool valley with a small streamlet flowing by the side. It was indeed a beautiful sight to watch them flying high up in the air—neither at a rapid nor at a lumbering speed—fluttering gently their whip-like wing tails and showing the bright red and blue black markings alternately. When disturbed, they fly high up in the air and it becomes a difficult operation to get at these even with a long handled net.

So far as I know the following appear to be the important references to the insect: Moore in the Proceedings of the Zoological Society for 1879 p. 394; Elwes in the Transactions of the Entomological Society for 1890 refers to this insect under the name of *Thymara caudata*, Moore, as having been got from Burmah. Of course, Hampson refers to it in the Fauna volume and puts down the distribution as the Nilgiris and Wynaad. I shall be glad to know whether any of the Society's members have collected this insect anywhere else in Southern India and, if so, during what part of the year and at which particular locality.

I am sorry I had to suddenly leave the hills and thus lose the opportunity of studying whatever was possible of the habits and life history of this very interesting insect.

T. V. RAMAKRISHNA AYYAR.

AGRICULTURAL COLLEGE, COIMBATORE,
15*th October* 1915.

No. XXXI.—THE HOST PLANT OF THE SCALE *INGLISIA CHELOINOIDES*, GREEN.

In June last year I happened to come across this beautiful scale on the common thorny plant, *Parkinsonia aculeata*, in the Agricultural College

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Farm, and on referring to Mr. Green's monograph of the Ceylon Coccidæ I found that he got only a single example of the insect and that on a twig of *Gelonium lanceolatum*. He further adds, "Several larvæ emerged and these were transplanted on to the bush but failed to establish themselves. I am inclined to think that Gelonium is not the normal food plant of the insect. In form and colour it bears a remarkable resemblance to a rose thorn and it is possible that its proper habitat may be a thorny plant." Some of the specimens I collected were forwarded to Mr. Green and in reply he wrote, "I am delighted at the possession of further material of this beautiful species and am very interested to find that my prediction as to the thorny habitat of the insect has proved to be correct." This year I was on the watch for the appearance of the insect and I have not been successful. As one who is paying some attention to scales, I shall be glad to know whether any members have come across this interesting insect, on any of the above two or different plants anywhere else in India.

T. V. RAMAKRISHNA AYYAR.

AGRICULTURAL COLLEGE, COIMBATORE,
15*th October* 1915.

No XXXII.—THE YE-SIN OR WATER-ELEPHANT.

One of the most common beliefs throughout Burma and the Shan States is that there exists an animal called the Ye-sin or water-elephant. This is an elephant which lives in the rivers of Burma exactly like a land elephant in every way except that it is about the size of a rat. It has power over ordinary elephants and for this reason is sometimes called the Sin-min. (In the same way a kind of cat has power over other cats and is called the Kyaung-min. There is also a cat which has power over tigers and is known as the Kya-min. Both these cats are species of civets.) If an elephant dies while crossing a river, it is nearly always said that it was owing to the power of the Ye-sin. Ye-sins are said to be very dangerous in the Sittang. Recently an elephant died near Pegu. A Burman told me that after it had died the foot-prints of a Ye-sin were found in its tracks near the river bank. A European in Toungoo some years ago told me he had seen a Ye-sin and he had no doubt whatever about the existence of the animal. (I always thought that it was the mouse-deer which gave rise to these beliefs.) About a week ago a Burmese lady told me that a woman had brought her a Ye-sin and that she had bought it for Rs. 5. She asked the woman how she got it and she said that an old Burman carrying a bag had come to her house and asked for a drink of water. She gave him the drink and asked what he had in the bag. He said that he was a fisherman and had caught a water-elephant in his nets. It had lived 3 days after he had caught it. He wanted to sell it for Rs. 25, but she succeeded in getting it into her possession and took it at once to its present owner and sold it to her for Rs. 5. I send it to you by registered post. I think you will agree that it is a very clever fake. The feet, trunk and tail are rather poor, but the rest is very like an elephant. It is quite good enough to deceive anyone who wished to believe in the existence of such an animal. This specimen is said to be unique in that it is complete. In most Ye-sins the legs or body are missing. I should be very glad if you would let me know what animals it is made of and return it to the enclosed address as the present owner values it very highly and only consented to

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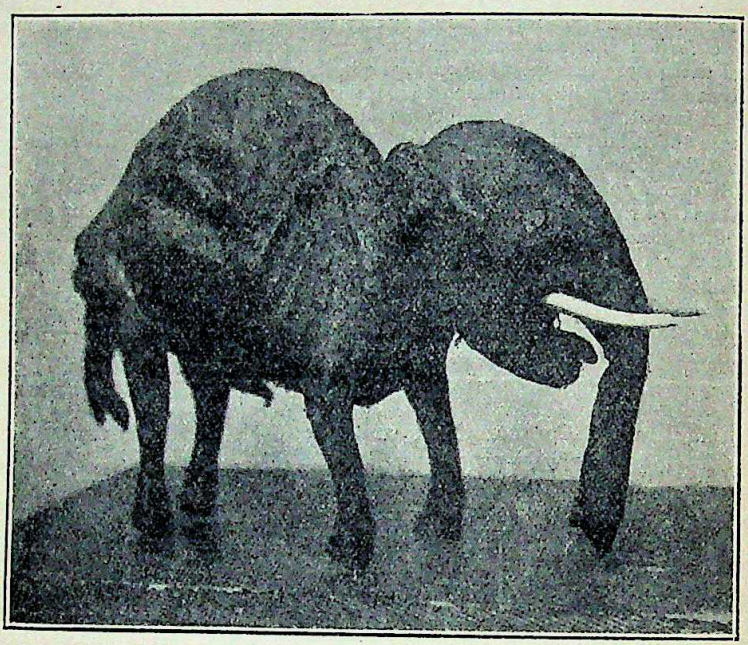

my sending it to you on condition that you return it to her intact. I enclose her name and address and ask you to be so good as to send it back to her.

S. F. HOPWOOD, I.F.S.

PEGU,

13th July 1915.

[The Water-Elephant is a wonderful curio. It is made out of the body of a squirrel, the feet and hands being cut off at the joints which gives it the appearance of having rounded feet like an elephant. The whole body is shortened by pressing in the hindquarters to give the curved back of an elephant and to the tip of the nose a trunk made of some skin is added, while on the side of the head two ears of the same material neatly fixed. The teeth of course are all taken out or covered up and tusks of bone or ivory are inserted on either side of the trunk.—EDITORS.]

No. XXXIII.—SUGGESTED EMENDATIONS IN ACT VIII OF 1912.

The Wild Birds and Animals Protection Act (VIII of 1912) marks a distinct step in advance towards the recognition by Government of the interests of Wild Life in this country. It has now been in force for exactly three years. The criticism which follow are intended to show that a comparatively simple emendation would render practical working of the Act considerably more simple.

The Achilles heel of the Act lies in the Schedule annexed at the end of it. This will be read by two classes of persons—those acquainted with English

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and those who are not. The Schedule as printed reads in English and in Hindustani as follows:—

English.	*Vernacular.*
(i) Bustards	BASTARD (T).
Ducks	MURGHABIAN.
Floricans	FLORIKAN (T).
Jungle Fowl	JANGLI MURGHABIAN (M).
Partridges	TITAR.
Peafowl	MOR.
Pheasants	CHIKOR (M).
Pigeons	KABUTAR.
Quail	BATER.
Sandgrouse	SENGRAUS (T).
Painted Snipe	CHAHE.
Spur Fowl	ASPARFAUL (T).
Wood Cock	HUDHUD (M).
Herons } Egrets }	BAGLE.
Rollers and King Fishers	ROLER (T).
(ii) Antelopes	KINGFISHR (T).
Asses	ANTELAUP (T).
Bison	GADHE (M).
Buffaloes	BAISAN (T).
Deer	BHAINSE (M).
Gazelles	BARASINGHE (M)
Goats	HIRAN.
Hares	BAKRE (M).
Oxen	KHARGOSH.
Rhinoceroses and Sheep	BAIL (M). GAINDE. BHERIAN (M).

With regard to the English Schedule it is hardly necessary to lay stress in this Journal (published by and for naturalists) or its scientific shortcomings. Those among our readers who have been called to the bar can moreover, as a matter of practical politics, imagine themselves successfully defending a client prosecuted (we will say) for shooting a serow—which is not included in the Schedule, or demonstrating on irreputable scientific authority that a Burrhel was neither a sheep nor a goat.

The Vernacular Schedule is of course nothing more nor less in most cases than a mistranslation or transliteration, by some person conspicuously lacking in Natural History knowledge, of terms which he did not understand. We have marked the mistranslations with the letter M—the transliterations with a T. Together they total seventeen specifications out of twenty-seven. The actual working of this Act will lie to a very large extent indeed in the hands of persons unacquainted with English, and to them 60 per cent. of the terms used are perfectly unintelligible. Naturally the Act as it stands can never be expected to work at all.

There is no adequate explanation. A double mistake has been made—and there is no more to be said on the subject. Fortunately both mistakes are very easy to remedy. The intention of the Schedule is clear enough. Any one armed with the "Fauna of British India" can make out a list of the birds and mammals to which the Act is intended to apply, which would satisfy both scientific and practical considerations. The "English"

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Schedule should follow the classification used in the Fauna of British India and should specify each species under its English and Scientific denomination. The vernacular list should comprise all the names under which those species are known to the people in the vernaculars of India. In printing it in vernacular transliterations of scientific nomenclature, which can only confuse the vernacular mind, should be scrupulously avoided. The preparation of this vernacular list would take time, and would involve enquiries in many outlying portions of the Empire, for the lists of vernacular names given in the "Fauna of British India" are by no means complete. Nevertheless the compilation is no impossible task, and it should certainly be undertaken. Government is, we all know, determined that its Acts shall be effective. Acts dealing with the wild life of the Empire can never be effective until they are "understanded of the people," as this Act will never be in its present shape. It is safe to say that not an Indian who has had the Act read to him can recognise under the terms BAIL, BAKRE or BHERIAN *any* form of wild animal: HUDHUD means a "hoopoe" and not a "woodcock," JANGLI MURGHABIAN could never in any part of India connote "Jungle Fowl." If the revision is undertaken, as we confidently expect it will be, we need hardly say that the services of the Society will be at the disposal of Government.

We would suggest one alteration only in the text of the Act. To section 3 should be added a clause :—

(*a*) "To take or possess, to sell or buy, or offer to sell or buy an egg or eggs or nest of any such bird."

The practice of taking the eggs of sitting pheasants and partridges is becoming increasingly common, and, to our uninstructed mind, the Act provides no safeguard against this malpractice.

G. C. HOWELL, I.C.S.

GURDASPUR,
2nd October 1915.

[We entirely agree with Mr. Howell's valuable suggestions and would draw attention to the Vernacular names of animals given in the Mammal Survey Reports published in our journals. In time we hope to complete these lists as the Survey is completed.—EDITORS.]

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PROCEEDINGS

OF THE MEETING HELD ON 31st AUGUST 1915.

An 'At Home' of members of the Bombay Natural History Society and their friends was held in the Society's Rooms on Tuesday, the 31st August 1915.

The election of the following 41 members since the last meeting was announced:—Mr. G. V. Fitzpatrick, Dharmsala; Major T. H. Symons, I.M.S., Hospital Ship "Madras"; Mr. R. H. Talbot, Silchar; Major E. W. C. Bradfield, I.M.S., Hospital Ship "Madras"; H. H. Ghanshyam Singhji, the Raja Saheb of Dhrangadhra, Kathiawar; Mr. J. G. Ridland, Bombay; Mr. G. C. Bannerji, B.A., Cuttack; Mr. Shiv Ram Kashyap, M.Sc., B.A., Lahore; Rev. John M. Paterson, Karachi; Mr. W. H. O. Shortt, Cachar; Mr. F. H. Edwards, Bhamo; Mr. Wm. Milburne, Assam; Mr. J. P. Mills, I.C.S., Assam; Mr. H. R. Meredith, I.C.S., Cuttack; Mr. G. G. Lydiard, Muzzafferpore; Mr. Satya Churn Law, M.A., B.L., Calcutta; Mr. G. Garnet Adams, Manpwe; Mr. E. Hicks, Assam; Mr. J. R. Jacob, Dharwar; Dr. G. P. Adamson, Cooch Behar; Maharaj Kumar Victor Narayan, Cooch Behar; Mr. R. Q. Hitchcock, Shahabad, Deccan; Lt.-Col. S. F. Biddulph, I.A., Neemuch; Mr. E. M. Rice, Sholapur; Mrs. W. A. Wilkinson, Dharwar; Mrs. Stephen, Simla; Major G. A. Hara, R.A., Dum Dum; Sirdar Kishen Singh, Dharmpur (Simla Hills); Capt. M. Ostrehan, Imphal; Mr. P. Broucke, Bagaha; Mr. C. Gordon Canning, Chainpattia; Mr. E. G. Meaton, Oorgaum; Mr. P. M. R. Leonard, Putao, Upper Burma; Mr P. K. Rivett Carnac, Muscat, Persian Gulf; Mr. A. Raymond Venis, I.A.R.; Mr. J. M. Mackay, Ahmedabad; Mr. G. Davis, Ahmedabad; Capt. L. F. Bodkin, Gyantse, Tibet; Mr. R. G. Sims, Rangoon; and Mr. John Coggin-Brown, M.Sc., F.G.S., Calcutta.

The Joint Honorary Secretaries acknowledged the following contributions to the Museum since the last meeting:—

Contribution.	Locality.	Donor.
1 Skull of Bison, *Bos gaurus* ..	Orisa ..	Mr. W. M. Crawford, I.C.S.
1 " " Cheetul, *Cervus axis*.		
1 Monkey, *Presbytis phayrei* ..	Taungdwingyi ..	Mr. F. C. Purkis.
1 Flying Squirrel, *Petaurista sp.*		
1 Malayan Palm Civet, *Paradoxurus hermaphroditus*.		
1 Golden Cat, *Felis temmincki* ..	Laza	Mr. M. R. Leonard.
1 Weasel, *Mustela strigidorsa* ..		
1 Water Shrew, *Nectogale sp.* ..		
4 Squirrels, *Petaurista sp.* ..		
2 Monkeys, *Presbytis sp.* ..		
1 Takin Skull, *Budorcas taxicolor*		
1 Wild Dog, *Cuon dukhunensis*.	Gangtok	Mr. C. H. Dracott, C.E.
1 Goral, *Cemas goral*		
1 Golden Cat, *Felis temmincki*.		
1 Black Bear (*juv*), *Ursus torquatus*.		

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Contribution.	Locality.	Donor.
1 Water Shrew, *Nectogale sikhimensis.* 8 Bird Skins	Gangtok	Mr. C. H. Dracott, C. E.
2 Young Wild Dogs, *Cuon dukhunensis.* 1 Hair Ball from Nilgai's stomach.	Saugor	Mr. D. O. Witt, I.F.S.
2 Jackals, *Canis indicus*	Rawalpindi ..	Mr. F. H. Tod.
2 Common Indian Foxes, *Vulpes bengalensis.*	Ahmednagar ..	The Collector.
1 Wild Dog (*alive*), *Cuon dukhunensis.*	Narsingpur ..	Mr. P. S. Patuck, I.C.S.
1 Flying Squirrel, *Petaurista albiventer.*	Garhwal	Mr. A. E. Osmaston.
1 Desert Fox, *Vulpes leucopus* .. 1 Desert Cat, *Felis ornata* ..	Hissar ..	Supdt., Govt. Cattle Farm.
1 Muntjac, *Muntiacus malabaricus.*	Kanara	Mr. G. Monteath, I.C.S.
2 Flying Squirrels, *Petaurista yunnanensis.* 2 Malayan Palm Civets, *Paradoxurus hermaphroditus.*	Katha	Mr. T. W. Forster.
2 Himalayan Tahr, *Hemitragus jemalicus.* 1 Panther, *Felis pardus* ..	Chamba ..	H. H. The Raja of Chamba.
1 Tibetan Wolf, *Lupus laniger* ..	Gilgit	Major Macpherson.
2 Otter Skins, *Lutra nair* .. 1 Flying Squirrel, *Petaurista phillipensis.* 2 Panther Skeletons, *Felis pardus.*	Canara	Mr. T. R. Bell, I.F.S.
1 Jungle Cat, *Felis affinis* .. 1 Malayan Palm Civet, *Paradoxurus hermaphroditus.*	Jalpaiguri ..	Mr. E. O. Shebbeare.
1 Skin of Marco Polo's sheep, *Ovis poli.*	Tagdumbash Pamirs.	Mr. W. B. Cotton, I.C.S.
2 Markhor, *Capra falconeri* ..	Baluchistan ..	Mr. F. M. Beaty.
2 Flying Squirrels, *Petaurista sp.*	Moarbhanj State.	Mr. C. Phillips.
1 Muntjac, *Muntiacus vaginalis* ..	Palamau	The Dy. Commissioner.
1 Skin and Skeleton of Wolf *Canis pallipes.*	Jamnagar ..	Major H. W. Berthon.
2 Bats, *Scotomanes ornata* ..	Kurseong ..	Mr. C. Primrose.
5 Bats .. .. .. 1 Hog Badger, *Helictis personata* 1 Toddy Cat, *Paradoxurus niger* 2 Otters .. .. .. 3 Rats	Bhutan Duars ..	Mr. H. V. O'Donel.
1 Hybrid Duck	Imphal, Manipur..	Mr. J. C. Higgins, I.C.S.

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Contribution.	Locality.	Donor.
1 Hedgehog (*alive*), *Erinaceus micropus.*	Ajmere	Mr. W. E. Shipp.
45 Bird Skins	Chin Hills ..	Mr. J. M. D. Mackenzie.
1 Sheldrake, *Tardona cornuta* 1 Lapwing, *Vanellus vulgaris*	Katha	Mr. H. R. Blanford.
1 Silver Pheasant, *Gennæus horsfeldi.*	Lashio	Mr. C. Innes.
1 Barbet, *Pyctolæmus gularis* 1 Crested Hawk Cuckoo, *Hierococcyx varius.*	Bombay	Mr. N. B. Kinnear.
3 Giant Herons, *Ardea goliath* (*alive*). 1 Goose (*alive*)	Busrah	Col. Sir Percy Cox.
1 Grey Lag Goose, *Anser ferus* 1 Bar-headed Goose, *Anser indicus* 1 Hybrid Mallard × Gadwall	Kashmir	Mr. M. T. Kennard.
1 Large Pintailed Sandgrouse ..	Mesopotamia ..	Capt. G.H.I. Graham
1 *Dipsadomorphus jollyii*	Miranshah ..	Agency Surgeon.
14 Snakes .. .. 21 Frogs .. .. 3 Lizards .. .. Crabs & few Leeches ..	Nilambur ..	Mr. A. P. Kinloch.
1 Sea Snake	Bay of Bengal ..	Sir Chas. Bayley.
1 Fat-tailed Lizard, *Eublepharis macularius.*	Bhopal ..	H. H. the Heir Apparent of Bhopal.
1 Skull and Skin of Gavial, *Gavialis gangeticus.* 1 Skull of Gavial, *Gavialis gangeticus.*	Lahore ..	Mr. Baini Parshad.
Some Moths & Dragon Flies ..	Fort Lockhart ..	Capt. Ruck.
Some Snakes	Siam ..	Dr. Malcolm Smith.
Some Snakes	Taunggyi, S.S.S...	Mr. Lightfoot.
1 Skin of Hare, *Lepus dayanus* 1 Otter, *Lutra barang* .. 1 Toddy Cat, *Paradoxurus niger.*	Agar, Malwa ..	Capt. E. G. Colvin.

Minor contributions from—Mr. Marryat, Mr. H. R. Hume, Mr. K. Kirby Latchen, Mr. A. A. Dunbar Brander, Sub-Assistant Surgeon, Drosh, the late Mr. H. Bulkley, Major N. A. Sitwell, Mr. E. H. Smith, Mr. P. F. Gomes, Mr. J. K. Kane, Mr. W. S. Millard, Mr. Lodge, Major Macpherson, Capt. W. Massey, Mr. Mackertish, Mr. Ritchie, Mr. S. Bilborough, Lt.-Col. A. Wilson, Col. Kirtikar, Mr. Powell, Khan Bahadur C. M. Cursetjee, Mr. A. Wright, Mr. Harter, Mrs. G. L. Taylor, Mr. C. H. Malan, Mr. Cairns, Mr. B. D. Barnes, Mr. E. O. Shebbeare, Lt. Saunders, Mr. E. Comber, and Mr. R. H. Brook.

A Special General Meeting of the members of the Bombay Natural History Society was held at the Society's Rooms, on Monday, the 27th September 1915, at 6 P.M., Mr. E. Comber, F.Z.S., presiding.

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BUSINESS.

To consider whether enemy subjects should continue to be members of the Society.

Mr. Comber proposed and Major Glen Liston, C.I.E., I.M.S., seconded the following proposition:—

"That the names of all enemy subjects, being members of this Society, shall be struck off the list of members."

Mr. John Wallace proposed as an amendment that in view of the many years of devoted service to the Society of the Revd. F. Dreckmann, S.J., and of the work done for the Society by the Revd. J. Assmuth, S.J., the following should be added to the resolution:—

"That the Honorary Secretaries shall write to the Revd. F. Dreckmann and the Revd. J. Assmuth expressing the regret of the Society that they have had to take this step."

This was seconded by Mr. E. Alban Williams.

The amendment was put to the meeting and carried.

The resolution with Mr. Wallace's amendment added was then put to the meeting as a substantive proposition and carried.

A vote of thanks to the Chair terminated the proceedings.

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JOURNAL
OF THE
Bombay Natural History Society.

JUNE 1916. VOL. XXIV. No. 3.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART XIX.

With a Coloured Plate.

PHASIANIDÆ.

Genus—*ITHAGENES.*

The genus *Ithagenes* is that containing the beautiful birds generally known as Blood Pheasants, so called on account of the deep crimson and blood-like splashes with which the breasts of some of the species are marked.

In the January number of the "Ibis" for 1915, I contributed a note on this genus, to which there is little to add, but in that note I did not deal with the two subspecies described as *bérégowskii* and *michaelis* or with the so-called species *wilsoni*.

The species then recognised were *Ithagenes cruentus*, *I. kuseri*, *I. geoffroyi*, *I. sinensis* and *I. tibetanus*; *bérégowskii* and *michaelis* are said to be subspecies of *sinensis*, but there is not sufficient material in English museums to enable one to definitely say whether they should be retained or suppressed. These two subspecies were described by Bianchi in 1903, the first, *bérégowskii*, from a bird obtained at Kansu. I have seen no species from this place. There is a very fine series of *sinensis* in the Tring Museum from the Tsin-Lin Mountains which are all very typical birds, and it would seem improbable that another subspecies should be found in Kansu which practically adjoins the South-Western end of the range of the Tsin-Lin Mountains. The second subspecies, *michaelis* is from Nan-Shan.

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As regards the two subspecies, it is impossible to say anything further in the absence of the types, and without sufficient skins for examination in England, but there is no chance of either of the forms being found in India.

The species *wilsoni* is named from two male birds, obtained by Messrs. Thayer and Bangs, and described in 1912. This bird appears to be a dwarf counterpart of *geoffroyi*, and they may possibly be either very young birds or abnormalities, but if more birds are obtained of the same size, it will form a most excellent and remarkable species.

To what extent the different species of *Ithagenes* will have eventually to be reduced to subspecies, it is impossible to say until birds from the areas linking those already worked have been obtained. Of *geoffroyi*, *sinensis*, *cruentus* I have been able to examine large series, but they have been mostly collected from comparatively small areas and I have no ground for splitting any of these into subspecies. Of *kuseri* there have been about a dozen skins available for examination, and these, though showing great variation *inter se* are all quite typical in their specific characteristics. Of *tibetanus* there is as yet only the single skin from which the bird was originally described, but the points of difference in this are so well marked that it does not appear likely that it will ever have to be reduced to the rank of a subspecies.

Omitting the species *wilsoni*, which, if good, can always be distinguished at a glance by its very small size (wing 169 to 171 mm., against 211 in *geoffroyi*), we have five species, of which *sinensis* has been divided into three by Bianchi.

The following key is a simple and easy one to follow, and holds good of all the examples I have had before me :—

KEY TO THE SPECIES OF ITHAGENES.

Males—

A.—Throat and chin crimson.

a. Forehead black ... ... *I. cruentus*.

b. Forehead crimson.

a'. Anterior ear coverts and gorget black ... ... *I. kuseri*.

b'. Anterior ear coverts yellowish with black edges. No gorget ... ... *I. tibetanus*.

B.—Throat and chin not crimson.

c. Inner secondaries and greater coverts of wings partly green.. *I. geoffroyi*.

d. Inner secondaries and greater coverts of wings partly tan-brown ... ... *I. sinensis*.

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Females—

1. Forehead of face and sides of head light

BOMBAY NATURAL HISTORY SOCIETY.

NOTICE.

In consequence of so many members being on active service in Mesopotamia, it has been considered desirable to publish a short account of the fauna of that country and with this object Mr. N. B. Kinnear, the Curator of our Museum, has prepared a pamphlet entitled

"NOTES ON THE ANIMALS (MAMMALS, BIRDS AND REPTILES) OF MESOPOTAMIA."

Any member who would like to obtain a copy to send to friends in Mesopotamia can obtain the same by applying to

THE HONORARY SECRETARY,
Bombay Natural History Society,
6, Apollo Street, Bombay.

17th June 1916.

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As regards the two subspecies, it is impossible to say anything further in the absence of the types, and without sufficient skins for examination in England, but there is no chance of either of the forms being found in India.

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Females—

THE POISONOUS SNAKES OF INDIA.

The new Edition of Lt.-Col. Wall's "POISONOUS TERRESTRIAL SNAKES OF OUR BRITISH INDIAN DOMINIONS (INCLUDING CEYLON) AND HOW TO RECOGNIZE THEM," with text figures, is still obtainable from the Society. This edition has been enlarged and brought up to date and a second part has been added giving a full account of the action and treatment of the poisons of different snakes.

PRICE TO MEMBERS Rs. 2-5-0 POST FREE, TO NON-MEMBERS Rs. 3-5-0.

Apply: Honorary Secretary, BOMBAY NATURAL HISTORY SOCIETY 6, Apollo Street, Bombay.

p[redacted]849); [redacted] 71 (1872) (Habits and Food); Hume and Marshall

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As regards the two subspecies, it is impossible to say anything further in the absence of the types, and without sufficient skins for examination in England, but there is no chance of either of the forms being found in India.

The species *wilsoni* is named from two male bird[illegible] by

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Digitized by Arya Samaj Foundation Chennai and eGangotri

Females—

A.—Feathers of face and sides of head light ochre brown, contrasting with grey crown.

a. General plumage rufous brown. *I. cruentus.*
b. General plumage brown ... *I. kuseri.*

B.—Feathers of face and sides of head grading into and not contrasting with grey of crown.

c. General plumage grey-brown... *I. geoffroyi.*
d. General plumage rufous brown. *I. sinensis.*

The female of *tibetanus* is not yet known.

According to Beebe's system of division of the *Phasianidæ*, the Blood Pheasants would come under the *Perdicinæ* or true partridges, which commence the moult of their tail feathers with the central rectrices, and from thence by regular steps to the outermost pair.

In form, generally speaking, the Blood Pheasants are not unlike Partridges, with somewhat lengthened tails, but their plumage is very soft and lax, and is also lanceolate in shape. The sexes are entirely different in plumage; the females being brown and almost unicoloured birds, whilst the males are grey with a variety of other colours on wings, breast and throat.

The tarsi are long and stout, and are furnished with several spurs in the male, which show as mere knobs on the legs of the female. The wing is short and rounded, the first primary being about equal to the tenth, and the fifth and sixth nearly equal and longest. The tail feathers number fourteen, and are graduated; the outermost pair being a little over half the length of the central.

The bill is very grouse-like in structure, and the nidification of this bird also shews a clear affinity to the true grouse.

There is a fairly well developed crest of soft feathers, of which the longest are about 18 inches, often not so long. The crest of the female is as full, but not so long, as that of the male.

ITHAGENES CRUENTUS (Hardw.).

The Blood Pheasant.

Phasianus cruentus.—Hardwicke, Trans., Linn., Soc., XIII., p. 237 (1822), (Nepal).

Phasianus gardneri.—Hardwicke, Trans., Linn., Soc., XV., p. 167 (1827), Nepal Valley.

Phasianus cruentatus.—Gray in Griffiths, ed., Cuv., III., p. 47 (1829).

Ithaginis cruentus.—Blyth, Cat. Mus. As. Soc., p. 241 (1849); Jerdon, B. of Ind., III., p. 522 (1863); Bland., J. A. S. B., XLI., pt. II., p. 71 (1872) (Habits and Food); Hume and Marshall

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Game B. Ind., I, p. 155, pl. (1878); Scully, Str. Feath., VIII., p. 343 (1879); Ogilvie-Grant, Cat. Birds, B. M., XXII., p. 268 (1893); Oates, Manual Game B., I., p. 228 (1898); Blanford, Faun. Brit. India, VI., p. 103 (1898); Sharpe, Handlist, I., p. 23 (1899).

Ithaginis cruentatus.—Hodges in Gray's Zool. Misc., p. 85 (1844); Ingram, Nov. Zool., XIX., p. 270 (1912).

Ithaginis cruentus cruentus.—Beebe, Zoologica, I. vol., p. 191 1912).

Ithaginis cruentus affinis.—Beebe, Zool., I., No. 10, p. 191 (1912) (British Sikhim).

Ithagenes cruentus.—Stuart Baker, Bull. B. O. C., XXXV., p. 18 (1914), *id.*, *ibis* (1915) p. 122; Finn, Indian Sporting Birds, p. 217 (1915).

Vernacular names.—Chilmeah, Chilmé, Chilmili, Seremin, Selmung, (*Nepal*); Samé, Semo, Soomong Pho (*Sikhim*).

Description—Adult Male.—Lores, forehead, supercilium and line under the eye, black; the black often changing to buff on the crown, and then again to grey on the longest crest feathers, which are centred with white streaks.

Whole upper surface grey, with central shaft streaks of white narrowest on the mantle, and broadest on the rump and upper tail coverts, where the white lines are bordered with black. Chin and throat crimson, the feathers with black bases which show through in varying degree, and those of the throat with tiny yellow white specks at their tips. Ear coverts, sides of the head and neck black and white or yellowish white; foreneck yellowish green; feathers with black bases and edges. In some birds the black is very slight in extent; in others, it covers a large portion of the feather. Upper breast yellowish green, more or less splashed with crimson; lower breast and flanks the same, with darker, greener borders, making this part appear to be coarsely striated; abdomen dull ashy buff, more or less covered by the lanceolate green feathers of the breast and flank. Under tail coverts crimson, with yellow spots at the tips.

Smaller and medium wing coverts like the back, but with broader shaft stripes on the latter; primaries and outer secondaries brown, white shafted, and sometimes mottled on the outer webs; greater coverts and innermost secondaries marked with green and with broad yellowish shaft stripes edged with black.

The longest tail coverts are edged with crimson; tail feathers pale brown, becoming almost white on the terminal part where they are more or less faintly mottled and edged with brown; the central tail feathers are broadly edged with crimson throughout their length, though most broadly so on the base, the outer feathers only at the base.

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Colours of soft parts.—"Cere, gape, palate, intense coral red to crimson; orbital skin scarlet to orange vermilion; bill black; iris red-brown, in others pale clear hazel; legs and spurs like the cere, crimson; claws dusky." (Hume.)

Measurements.—"Length 17·75 to 19·5; expanse 22·5 to 26·0; wing 8·0 to 9·0; tail 6·5 to 7·0; tarsus 2·75 to 3·0; bill 0·81 to 0·87: weight 1 lb. 1 oz. to 1 lb. 4 oz." (Hume.)

The large series of *cruentus* examined by me in the British Museum and elsewhere have wings from 7·6″ (=193·0 mm.) to 9·2″ (=233·7 mm.) The bill at front about ·80″ (=203 mm.), and from gape about 1·0″ (=25·4). The other measurements agree with Hume's. The number of spurs vary from 3 to 4, or even 5. The number often varying on the two legs of the same individual.

Adult Female.—Forehead, sides of the head, chin and throat rufescent ochre; anterior crest and nape slaty grey, toning off into the colours of the surrounding parts. Remainder of upper parts, wings and tail rufescent earth-brown, finely vermiculated all over with dark brown, more boldly on the tail and primaries than elsewhere. Outer tail feathers more rufescent, and still more boldly marked. Lower surface bright rufous brown, immaculate on foreneck and breast, and vermiculated finely with dark brown on flanks, sides of the abdomen and thighs, under tail coverts the same, but darker and more closely vermiculated or barred with dark brown. Primaries brown, more or less vermiculated in the outer webs; inner secondaries like the back, but more boldly marked.

Colours of soft parts.—"Bill black; cere and orbital skin carmine yellow; legs intense carmine; claws dusky, iris brown." (Hume.)

Measurements.—"Length 16·5 to 17·0; expanse 21·0 to 23·0; wing 7·62; tail 5·5 to 6·0; tarsus 2·6 to 2·75; bill 0·8 to 0·9; weight 12 oz. to 1 lb. 1 oz." (Hume.)

Young Male.—According to Jerdon, the young males, when only half grown, have the plumage of the adult male, only less brilliant, and the base of the bill is coloured red like the cere, only more yellowish.

Quite young birds of both sexes have the orbital skin, and bare area of the face a fleshy grey, and a red bill. Hodgson notes:

> "One specimen that I obtained in September, and which "was by dissection a female, shewed the anomaly of a deep "coraline red bill. Later, I got other specimens shewing the "same peculiarity; all these had the cheeks fleshy grey. It is "evident to me that the red bill is a sign of non-age, and that "it becomes gradually black."

Distribution.—The Blood Pheasant is found throughout the Northern higher ranges of mountains in Nepal, *probably* as far West as the Gogra River. Eastwards it extends along Sikhim into

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Western Bhutan, but appears to be replaced in extreme South-Eastern Tibet by *tibetanus*. Northwards it is at present unknown how far it extends, but I have long had records of the existence of a Blood Pheasant in the Chambi Valley, and have recently received from that Valley, skins of specimens shot and trapped off their nests which are quite typical *cruentus*.

Southwards in Nepal it is only found on the higher spurs, running from the main ridge, keeping, according to Hooker, between 10,000 feet and 14,000 feet, but probably descending to 8,000 feet in the winter.

In Sikhim it is found as far South as the Singalila Range, and perhaps even further South on the Damsang Range, North-West of Darjiling, whence I have received the nest of an *Horornis*, containing the feathers of a Blood Pheasant.

Oustalet's and Ingram's record of this bird as occurring in Yunnan is undoubtedly incorrect, and the bird referred to is *Ithagenes kuseri*.

Nidification.—The only note hitherto recorded, is that of Hodgson, who writes:

> "The nest is placed on the ground amongst the grass and "bushes, a loose nest of grass and leaves. The eggs, ten to "twelve in number, are laid towards the end of April and in "May, and the young are ready to fly in July. Only the "mother feeds and cares for the young."

I have never taken the eggs myself, but in 1910 a European collector, who was working for me in Sikhim, sent me twelve eggs, which he said were those of the Blood Pheasant. He informed me that he had failed to trap the old birds, but had distinctly seen both male and female of the two nests from which they were taken, and that there was no doubt about them.

The two nests were taken in the first week of May 1910, at an elevation of about 12,000 feet in Native Sikhim, and were placed at the foot of bushes growing in stunted pine forest. There was no real nest, the eggs being laid on a thick bed of leaves and rubbish which had accumulated in a natural hollow.

The eggs were extraordinarily like eggs of the Grey Hen, though paler and redder, and quite indistinguishable from those of *Ithagenes kuseri* and *Ithagenes geoffroyi*, the latter of which are described and depicted in the Catalogue of the Eggs of the British Museum. Unfortunately, at the time these were taken, I did not know what the eggs of the genus *Ithagenes* were like, and a dealer in Darjiling, having recently sold a collection of European Game and Water-Birds' eggs, I was afraid to accept my collector's identification as beyond doubt, and returned him these eggs to do what he liked with.

This year, 1915, Mr. D. Macdonald succeeded in obtaining for me a pair of birds which were both trapped on the nest on the 28th

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May in the Chambi Valley, Tibet. The eggs were, unfortunately, all smashed. From the fact of the male having been snared either on or in the immediate vicinity of the nest, it certainly looks as if sometimes the male did take an interest in the eggs and young.

Habits.—The Blood Pheasant inhabits only mountain ranges, just below the snow level, descending in the winter as low as some 8,000 feet, and ascending in summer as the snow recedes as high as 15,000 feet, or to even greater heights. They are sociable birds, being found either in family parties of from ten to fifteen birds, or in flocks of from twenty to forty, when two or more families join forces. They are very tolerant of extreme cold, and are often found frequenting country still deep under snow, though they are not more or less semi-hibernators, as suggested by Dr. Hooker.

Hodgson remarks of the Blood Pheasant :—

> "This species is common in Nepal in flocks of twenty to thirty, in the same situations as the Moonal; that is to say in the higher forests and in the immediate neighbourhood of the snow, even outside, though always near the forests.
>
> "They greatly affect the clumps of Mountain Bamboo, and feed about on the ground amongst these much like domestic fowls, turning over the leaves and grasses with their feet, scratching about in the ground, and picking up insects, grass, seeds, grain, and wild fruits.
>
> "They do not eat the bulbous roots of which the Moonal is so found. On any alarm the whole flock utter a sharp alarm-note (ship, ship) and scuttle away.
>
> "In the winter the birds come Southward a little, but never approach the Great Valley. Numbers are caught in November and December, and in their own haunts they are, by no means, rare. Packs are often seen consisting of as many as 70 to 100 birds. They ascend and descend with the snow, and are easily captured, being fearless and stupid. They prefer somewhat inaccessible places. Their flight is short and feeble.
>
> "Adult males have often three spurs on each leg, and natives say that they are sometimes found with as many as five."

All writers agree that the Blood Pheasant is a remarkably stupid bird, and that when a flock is found it is quite possible with patience and hard work to exterminate the whole of it. The birds after each shot merely move on a few yards, generally running in preference to flying, and can be put up or driven into the open one after another until the last falls a victim. They are also very easy to snare, and the Nepalese and natives of Sikhim catch large numbers, which they use as food or for sale to visitors in Darjiling.

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The usual mode of trapping them is by setting snares in openings of a long brush fence or wall of stones and boulders; when the birds come to this, they generally work down it until they come to the opening, in passing through which they are at once caught by one or both legs. They are also enticed into the ordinary spring noose, baited with corn or grain, which has already been described in previous articles.

According to Hooker, as quoted by Hume:—

"This, the boldest of the Alpine birds of its kind, frequents the mountain ranges of Eastern Nepal aud Sikhim at an elevation varying from 10,000 to 14,000 feet, and is very abundant in many of the valleys among the forests of pine (*Abies webbiana*) and juniper. It seldom or never crows, but emits a weak cackling noise. When put up, it takes a very short flight, and then runs to shelter. During winter it appears to burrow under or in holes amongst the snow; for I have snared it in January in regions thickly covered with snow, at an altitude of 12,000 feet. I have seen the young in May. The principal food of the bird consists of the tops of the pine and juniper in spring, and the berries of the latter in autumn and winter; its flesh has always a very strong flavour, and is moreover uncommonly tough; it, however, was the only bird I obtained at those great elevations in tolerable abundance for food, and that not very frequently. The Bhutias say that it acquires an additional spur every year; certain it is that they are more numerous than in any other bird, and that they are not alike on both legs. I could not discover the cause of this difference; neither could I learn if they were produced at different times. I believe that five on one leg, and four on the other, is the greatest number I have observed."

Hume also quotes a letter written by Jerdon to Elliot in which he says:—

"The only time that I have myself seen the *Ithagenes* was in September 1868, on a trip to the Singhaleela Range, West of Darjeeling. This is a lofty spur that runs South from Kinchinjunga, ending in Mount Tonglo, 10,000 feet. At about 12,000 to 13,000 feet a covey of these beautiful bird, crossed the mountain path I was ascending; and quickly calling for my gun, I knocked one or two over on the ground. Only one bird rose on the wing after I fired; and it settled down again almost immediately, the rest escaping by running into the underwood in the forest. A native Shikari followed them up, and succeeded in securing three or four more of the family. The young were nearly half-grown, and the cock birds were clothed in the adult male plumage, not so bright or

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well-marked of course as an old bird. The bill of the female is dull reddish at tip, and chestnut at base; the nude orbital skin in the male rich blood-red, and the irides red-brown, the bill being dusky or black at the tip. I see in Hodgson's drawing of this bird that the bill of the female is rightly given red. I could not notice exactly how the tails were held, except that they were certainly raised whilst running. The food of those examined consisted entirely of vegetable matter. The skins of this beautiful bird previously brought into Darjeeling have all been procured at considerable distance in the interior of Sikhim; and I was rather surprised to find them here in such a damp climate and so near the plains; but as the Singhaleela spur is higher than any other range running South, I fancy they have gradually spread along the ridge as far as it continued suitably elevated."

Blanford describes its cry as—

"a peculiar long cry, something like the squeal of a kite. "The only other note I have heard was a short monosyllabic "note of alarm; I have heard a bird utter this when sitting on "a branch within twenty yards of me."

They appear to be almost entirely vegetarian in their diet, Hodgson alone of those who have recorded anything on this point crediting them with eating insects. Blanford records that—

"in their crops I found small fruits, leaves, seeds, and in "one instance what appeared to me to be the spore-cases of a "moss. There were no leaves or berries of juniper."

Although Hooker found it unsatisfactory eating, Blanford considered it excellent, and other sportsmen and observers who have eaten them have told me that they found them tender and sweet, though somewhat dry.

Very few specimens of this bird have been imported into Europe in a captured state, but one such pair was purchased by the Zoological Society a few years ago. Finn, referring to this pair, says, that they struck him as very partridge-like in appearance; he also records that Mr. W. Frost, the importer, told him that they were spiteful with other birds, and backed each other up, the hen waiting on an elevated spot till the cock ran a bird under her, when she would spring on it and do her share of the mauling.

ITHAGENES KUSERI, Beebe.

The Yunnan Blood Pheasant.

Ithaginis kuseri.—Beebe, Zoologica, I., No. 10, p. 190 (1912); N. W. Yunnan; F. M. Bailey, Journal B. N. H. S., XXIV., p. 76.

Ithagenes kuseri.—Stuart Baker, Bull. B. O. C., XXXV., p. 18 (1914); *Id, ibid* (1915), p. 122.

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Ithagenes cruentus.—Oustalet, Bull. Mus. Paris, p. 185 (1896) Yunnan; Ingram, Nov. Zoo., XIX., p. 270 (1912) Yunnan.

Vernacular names.—Seri (*Tibetan*); Chiku (Mishmi); Seto (*Kong-Mo*).

Description—Adult Male.—Forehead and a broad supercilium, chin, cheeks and anterior ear-coverts crimson; the supercilium with the feathers more or less tipped black; lores generally black, sometimes mixed with crimson, and sometimes almost entirely of this colour. Occiput ochre-yellow, changing into deep slaty grey on the sinciput and nape; the feathers more or less centred paler; sides of the head including semi-erectile feathers next the crimson black, the black extending through the posterior ear-coverts as a gorget round the crimson of the throat. Breast a vivid crimson pink or crimson, the feathers with narrow greenish-yellow central streaks, these increasing in width on the posterior flanks and lower breast until the crimson practically disappear; here also the green deepens in tint, and a few of the feathers have dark greenish black edges; the centre of the abdomen, vent, thighs and flanks above the green dull grey; the thighs and abdomen more or less stippled with fulvous-blackish; under tail coverts crimson with terminal spots of greenish yellow.

Above, the nape is grey with numerous finer lines of yellowish white, which increase in width on the sides of the neck, making this look like an almost pure white patch, whole remaining upper parts grey, with white shaft lines, these broader on the rump upper tail coverts and innermost secondaries, and having the white narrowly edged with black; longest upper tail coverts edged with crimson; tail grey-brown sub-edged with paler purer grey, and, with the exception of one or two of the outermost pairs, broadly edged with crimson on all but the terminal inch.

Quills of the wing dark brown edged with whitish on all but the first three primaries, greater coverts grass-green with pale central streaks, other coverts like the back.

Colours of soft parts.—Iris yellow or light brown; bare space about the eyes yellow, inclining to orange behind the eye; bill black with the nostril and cere scarlet; legs scarlet, claws dark horny brown; spurs like the male, tipped black, or wholly black.

Measurements.—Wing from 7·75″ (=196·8 mm.) to 8·25″ (=209·5 mm.); tail 5·8″ (=147·3 mm.) to 6·75″ (=171·4 mm.); tarsus about 2·3″ (=58·4 mm.); bill at front about ·75″ (=19·0 mm.), and from gape a little over 1″ (=25·7 mm.).

Adult Female.—Differs from the female of *I. cruentus* in being very much darker all over. The rufous in *I. cruentus* is replaced by brown in *I. kuseri*, and the breast is vermiculated with brown and buff, instead of being almost plain rusty rufous as in that bird.

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The slate colour of the head and nape is much darker, almost black, and the chestnut of the forehead and sides of the head appear to be rather richer in tint.

Colours of the soft parts.—Have not yet been recorded, but judging from the skin, the legs appear to have been a fawny brown, probably tinged with flesh colour in life. The cere and orbital skin has evidently been orange-red, and the bill practically black.

Measurements.—The female is rather smaller than the male; the wing varying from 7·2″ (=183·9 mm.) to 7·80″ (=190·1 mm.), with the other measurements in corresponding proportion.

Distribution.—Originally obtained in Yunnan Hills on the Mekong River, and now known to extend from the Mishmi and Abor Hills North and East of the Dihong or Brahmaputra River into the higher ranges of Burma and Yunnan into the North of the Shan States.

Nidification.—The only description of this bird's nesting is contained in a letter written to me by Capt. F. M. Bailey, as follows:—

> "I send you two eggs of the Blood Pheasant, which were got by Morshead. He found the nest in the Mishmi Hills at about 12,000 feet in the beginning of May. There were three fresh eggs on the ground under a clump of bamboo, the ground around being under snow."

The two eggs sent me are regular *Lagopus* eggs, and could hardly be distinguished from some of the eggs of that bird.

The ground colour is a pale orange or pinkish buff, and they are profusely covered over the whole of their surface with specks, spots and irregular small blotches of rich sienna brown, in both eggs the blotches being somewhat more numerous round the centre of the eggs than elsewhere.

The shell is very stout, and is close and firm in texture, with a distinct gloss. In shape the eggs are regular ovals, the smaller end being practically the same as the larger. They measure 1·77″ × 1·26″ (= 244·9 × 32·0 mm.) and 1·76″ × 1·25″ (= 44·7 × 31·7 mm.)

As regards the habits of the Yunnan Blood Pheasant, these seem to differ in no way from those of the Nepal bird.

They have been frequently seen recently by various members of the different surveys of the Mishmi and Abor Hills, and all agree that the birds are remarkable principally for their fearlessness and lethargy.

Capt. Bailey writes me:—

> "They are most extraordinarily common in certain parts of the country we visited, keeping close to the snow-line, and apparently moving up and down between 8,000 and 12,000 or 14,000 feet as the snow increased or receded with the cold and warm seasons. They are often found well above the snowline,

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and indeed, frequently in deep snow. Once when I was snowed up for several days, these birds came round my tent, and I actually shot them from my tent door. They go about in flocks of from ten to twenty, and they fly very unwillingly, and when forced to take wing, settle again almost immediately, and take to their legs, escaping by running.

"I lived upon these Blood Pheasants for some time, and found the flesh good, but the legs were very tough; I have notes somewhere on the contents of their crops, which I will send you if I can find them.

"Their call is the same as that of the other Blood Pheasants, *geoffroyi* is the one I know best, a kind of whistle, hard to describe.

"I found them in the upper Dihong Valley and also in Po Me, at least, I think the bird in the latter place is the same, though I did not actually kill any specimens there.

"I have never found them in the open, but always in fairly heavy forest."

In the Society's Journal, Captain Bailey adds to these notes certain additional information as follows:—

"Very common and confiding in the Upper Dibang Valley. Also common in Po Me. It lives at higher elevations than the Monal and Tragopan, and was frequently seen on snow, but, always in forest, and prefers dense undergrowth. Gathers together in flocks of ten to twenty. It does not fly readily.

"Some Blood Pheasants, probably of this species, were seen on the hills on the right bank of the Tsangpo below Pemakochung at about 11,000 feet. We were told that there were Blood Pheasants in the Tsari Valley. Blood Pheasants were also seen on the Pöshing Poshingla La in Mönyul, probably *I. tibetanus*, described by Mr. Stuart Baker from a specimen obtained by Captain Molesworth (Bulletin of B.O.C., vol. XXXV., p. 18). The Mishmis trap the Pheasants in their country and also the hill partridges (*Arboricola*) in the following way:—A light fence is made of twigs about 18 inches in height, usually along a contour of the hill in the forest. In this gates are kept open just wide enough to admit a bird, and in these openings a noose made of fine roots and fixed to a bent springy bamboo. The birds when feeding wander down to the fence and do not fly or hop over, but follow it until they reach one of the gates, and the first bird to pass is usually caught."

Another writer to me says that he—

"generally found them feeding in the bamboo jungle which grows up close to the snow-line, but occasionally, especially early in the mornings and late in the evenings, on the open

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hillside alongside the bamboo. When there was snow on the ground, they were very conspicuous, the females showing as brown blobs, and the males looking like little patches of vegetation with crimson flowers. They would make no attempt to move until fired at, and even then would often settle again almost within gunshot. We found them sometimes in flocks numbering about forty, or even more, though, as a rule, they were in parties of about a dozen.

"Those we shot had been feeding on seeds and vegetable matter mixed with insects."

ITHAGENES TIBETANUS.

Molesworth's Blood Pheasant.

Ithagenes tibetanus.—Stuart Baker, Bull. B.O.C., XXXV., p. 18 (1914) (Tela Range, Tibet); *Id. ibid.* (1915), p. 122.

Vernacular names.—None recorded.

Description—Adult Male.—Forehead crimson, with this exception, the whole upper plumage as in *cruentus*, but the white marking on the nape much less developed than in that bird. Lores, a small supercilium and feathers round bare orbital skin crimson, together with the chin, throat and anterior portion of ear-coverts; posterior ear-coverts black with broad white central streaks. Extreme base of throat and lower neck very pale greenish-yellow, some of the central feathers margined with black; sides of the neck the same with the black still less in extent.

Breast yellow, faintly tinged with green, and each feather broadly, but rather irregularly bordered and splashed with crimson, far more so than in any specimen of *cruentus*. Flanks and abdomen grey with broad yellow-green streaks, and a few splashes of crimson of the former; centre of abdomen buff and grey, the former predominating. Under tail coverts crimson with yellow spots at the tips. The tail feathers are a good deal darker than in *cruentus*, but are paler than in *kuseri*. Wings as in *cruentus*, but with the green less pronounced.

Colours of soft parts.—Legs brilliant crimson-red, soles paler and more dusky, claws black; space round eye appears to have been orange; bill black, nostrils crimson.

Measurements.—Total length about 15″ (= 381·0 mm.); wing 7·75″ (= 196·8 mm.); bill at point ·7″ (=17·7 mm.), and from gape ·8″ (=20·3 mm.); tarsus 2·35″ (=59·7 mm.); mid toe 2·0″ (=50·8 mm.); claw ·55″ (=13·9 mm.); tail 6·75″ (=171·4 mm).

Female, not known.

Distribution.—The one bird as yet obtained was shot above Tawang on the Tela Range in Tibet. It would appear likely therefore that this Blood Pheasant will be found to inhabit the country

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in S. E. Tibet between the Ranges of *I. cruentus* on the West and *I. kuseri* on the East.

Nidification, not known.

Habits.—Capt. Molesworth, the discoverer of this beautiful game bird, writes that he found it extremely plentiful on the Tela and adjacent ranges, where they were in large flocks. Capt. F. M. Bailey, who passed over the same ground, but, alas, after nearly all his cartridges had been stolen, tells me that these birds were very numerous over a wide area wherever the country was suitable.

All the different species of Blood Pheasants would appear to frequent the higher slopes and ridges of the mountains they inhabit, not haunting the ravines and smaller valleys, however high the elevation of these may be. Molesworth's Blood Pheasant, like the rest, keeps to fairly thick cover, but in the mornings and evenings comes out into the open glades and grass-land beside the pine forests and bamboo jungle.

ITHAGENES GEOFFROYI (Verr.).

Verreaux's Blood Pheasant.

Ithaginis geoffroyi.—Verreaux, Bull., Soc. D'Acclim (2) IV., p. 706 (1867); David. and Arch. Mus. Bull., VII., p. 11 (1871); David. and Oust., Ois. Chine, p. 401, pl. 113 (1877); Seebohm, *ibid* (1891), p. 381; Ogilvie-Grant, Cat. Birds, B. M., XXII., p. 269 (1893); Oustal., Nouv. Archiv. Mus. Paris (3), VI., p. 77 (1894); Ogilvie-Grant, Game B., I., p. 218 (1895); Sharpe, Handlist Birds, I., p. 33 (1899); Bower, Diary Journ. Across Tibet., p. 235; Davies, *ibid* (1901), p. 408; Oates, Cat. Eggs, B. M., I., p. 50 (1901); Beebe, Zoologica I., No. 10, p. 191 (1912).

Ithagenes geoffroyi.—Stuart Baker, Bull. B.O.C., XXXV., p. 18 (1914); *ibid* (1915).

Vernacular names.—None recorded.

Description—Adult Male.—Forehead, lores, a broad supercilium and feathers surrounding bare orbital patch black; crest slaty grey; the feathers with almost invisible tips of black; cheeks and ear-coverts dark ashy grey with white shaft streaks; chin very dark ashy grey, paling on the throat, upper breast and sides of the neck, the latter as well as a few at the sides of the breast, having white shaft streaks. On the lower breast and flanks the colour changes from grey to bright yellow-green, each feather with broad pale centre, bordered with dusky on the upper abdomen and posterior flanks; abdomen, vent and thighs ashy, the thigh feathers with white shaft streaks.

Under wing coverts and axillaries grey. Whole of the upper plumage and wing coverts grey, the feathers all more or less lanceolate, and with white central stripes, bordered with blackish; on the

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shoulders the stripes are very narrow, and the dark borders imperceptible, but these increase gradually in extent until they are broadest and most conspicuous on the upper tail coverts and wing coverts; greater wing coverts and innermost secondaries green with pale central streaks; quills brown, darker on the inner webs and with white shafts, the white extending to the webs on the secondaries; some of the upper tail coverts edged with crimson. Tail greyish white, darkest in the centre, and all but the outermost pair with fringes of crimson, broadest at the bases and obsolete at the tips. Under tail coverts black at the bases, crimson on the terminal halves, and with a spot of white surrounded with dusky at the extreme tips.

Colours of soft parts.—As in *cruentus*.

Measurements.—About the same as in the Common Blood Pheasant.

Adult Female.—Whole head, throat and neck slaty grey with a touch of ferruginous on lores and above eye; shafts of ear-coverts white. The whole of the remainder of the plumage is a vermiculated grey-brown, greyest next the neck where the colours blend, and brownest on the tail and secondaries; the pale vermiculations are strongest on the upper tail coverts and edges of the tail feathers. The under plumage is a trifle paler than the upper, and the pale shafts are somewhat more distinct. The whole aspect of the bird is far more grey than it is in any other female of this genus.

Colours of soft parts.—As in the female of *cruentus*.

Measurements.—The female is slightly smaller than the male with a wing of about 7·5″ (= 190·5 mm.) as against full 8″ (= 203·2 mm.) in that sex.

Ogilvie-Grant, both in the Catalogue and in his Game Birds, gives the length of the female as 11·5, *i.e.*, only about two-thirds the size of *cruentus*. This is an obvious mistake, and is probably only a printer's error in the first instance for 17·5.

Distribution.—The extreme South-East of Tibet, East of the Dong and Brahmapootra River and the Szechuen Mountains in West and West-Central China.

ITHAGENES SINENSIS (David.).

The Chinese Blood Pheasant.

Ithaginis sinensis.—David., Ann. Sci. Nat. (5), XVIII., Art. 5, p. 1 (1873), XIX., Art. 9, p.1 (1874); David. and Oustalet, Ois Chine, p. 402, pl. 114 (1870); Rowley, Orn. Misc., II., p. 421 (1877); Ogilvie-Grant, Cat. Birds B. M., XXII., p. 290 (1893); *id*, Game B., I., p. 219 (1895); Ogilvie-Grant, *ibid* (1900), p. 606; Styan, *ibid* (1899), p. 298; Sharpe, Handlist, I., p. 33 (1899).

Ithaginis geoffroyi.—Pejev. Mongolia, II., p. 122 (1876); *id*, in Row. Orn. Misc., II., p. 421 (1877).

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Ithaginis sinensis sinensis.—Bianchi, J.F.O. (1904), p. 73-79.

Ithaginis sinensis bérézowskii.—Bianchi, Annuaire Mus., St. Petersb., VIII., p. 1-10; *id.* J.F.O. (1904), p. 75.

Ithagenes sinensis.—Stuart Baker, Bull B.O.C., XXXV., p. 128 (1915).

Vernacular names.—Sermun (Chinese, Kansu).

Description.—Adult Male.—Lores, forehead, supercilium and cheeks blackish; crown and crest ashy grey with pale shafts and dark tips; ear-coverts blackish brown with narrow white streaks; chin, throat and upper breast dull pale fulvous ashy, darkest on the chin, and with obsolete pale centres.

The colour grades on the lower breast and on the flanks into bright yellow-green, each feather with a narrow, but distinct black edge, and with paler centres to a few in the middle of the lower breast; in some birds the black edges are absent on the flanks; anterior flanks ashy brown with pale centres, bordered with dark brown; abdomen and vent ashy brown; under tail coverts crimson, the bases of the feathers black and the tips white with black borders.

Under wing coverts and axillaries grey with white shaft lines. Whole upper plumage, sides of neck and wing coverts ashy grey with white shaft stripes bordered with blackish brown, a few of the outer tail coverts with crimson fringes at their bases; rectrices ashy grey, all but the outer, and sometimes the two outer, pairs with crimson fringes.

Greater wing coverts and innermost secondaries rich ochre brown with narrow white central striæ and parallel lines of blackish. Quills brown with white shafts, the white forming ill-defined blotches at the tips.

In most birds there is a distinct trace of crimson on the chin and sides of the face. The chestnut of the wing varies very greatly. In a few birds it is a vivid chestnut red, whilst in others it is a pale dingy rufous ochre. Very rarely it is faintly suffused with green, and in a few individuals also the edges of the feathers are crimson.

Colours of soft parts.—"Eyes yellow;" Styan. Colours of other parts as in *I. cruentus.*

Measurements.—About the same as in *I. cruentus* or a trifle smaller. The large number I have examined have wings varying from 7·8″ to 8·9″ (=198·1 to 226 mm.).

Adult Female.—Crest slaty grey, rest of head, cheeks, chin and throat dull greyish fulvous, each feather with a faint white centre, some of the posterior long-ear coverts dark brown, and others with concentric lines of brown following the contour of the feather. Remainder of upper plumage rufous brown, vermiculated with dark brown, the two colours approaching broken bars in character at the end of the rectrices and inner secondaries.

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Below the colour is an almost immaculate rufous brown, palest and highest on the abdomen, but well vermiculated with dark brown on the under tail coverts and flanks.

Colours of soft parts.—As in *I. cruentus.*

Measurements.—Practically the same as in *I. cruentus.*

Young Male.—After first autumn moult, like the adult, but retaining more mottling on the inner secondaries and with less green on the lower plumage.

Nestling.—Whole upper plumage with the feathers of the mantle, scapulars and wing coverts, marked with blackish brown and with pale fulvous tips. Remainder of back and head less distinctly marked. Quills mottled with rufescent fulvous and blackish brown.

I cannot separate Bianchi's subspecies *bérégowskii* from typical *sinensis.* There are three of Bérégowskii's specimens in the British Museum Collection which are indistinguishable in every respect from many individual specimens of typical *sinensis.*

(*To be continued.*)

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SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY, No. XIII.

A.—On Muridæ from Darjiling and the Chin Hills.

By Oldfield Thomas.

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1.—A new Genus of Giant Rat from Sikkim.

Among the collections recently made in British Sikkim by Mr. N. A. Baptista for the Bombay Survey with the active help and interest of Mr. R. S. Lister and Mr. H. Stevens are three Giant rats belonging to two species, both much larger than any other strictly Indian species of *Epimys*, and rivalling Bandicoots in size. One of them, represented by a single specimen, is clearly an *Epimys*, and is dealt with under the next heading below.

The other, like as it is to a true rat externally, proves on study of its skull to show such dental characters as to necessitate the formation of a new genus for its reception. This may be called :—

Dacnomys, g. n.

External characters and quality of fur as in *Epimys*. Mammæ of genotype 2-2=8.

Skull with prominent overhanging supraorbital ridges, more developed than in most *Epimys*, less than in *Lenomys* and *Lenothrix*; the shape of the crown between the ridges about as in *Lenothrix*. Anterior plate of zygoma very slightly projected forward, about as in *Diplothrix*,* rather more than in *Lenothrix*; less than in *Lenomys*, much less than in *Epimys*. Bullæ quite small.

Teeth.—Incisors normal. Molars very large, broad and heavy as compared with all forms of *Epimys*, nearly equalling those of *Lenomys*, the length of the series more than half the distance from the back of M^3 to the condylion; breadth of palate between first molars rather greater than the breadth of a molar.

In structure, owing to their size and angularity, the teeth have a strong superficial resemblance to those of *Lenomys*. But in detail

* G. n. Genotype *Diplothrix legata* (*Lenothrix legata*, Thos. Ann. Mag. N. H. (7) XVII, p. 88, 1906) from the Lin Kiu Islands.

A further study of these Murines convinces me that the Liu Kiu *Lenothrix legata* ought to be generically distinguished from its Sumatran ally *L. cana*, Miller. The great breadth of the crown area between the parietal ridges, which is broader than long, and gives quite a different aspect to the upper view of the skull, the greater projection forward of the zygomatic plate, and certain detailed differences in the molars, described in the original account, are my chief reasons for this separation, which is also in accord with the geographical distribution of the two forms. I may further note that in *Diplothrix* the posterior lamina of M^3 consist of two elements, an internal and a median cusp, not of a single cusp only as Mr. Miller says is the case in *Lenothrix cana*. M^1 and M^2 practically without antero-external supplementary cusps.

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they agree on an exaggerated scale more with those of certain species of *Epimys* (*e.g.*, *E. macleari* and *blanfordi*), with some approach to those of *Lenothrix*.

M^1 with the laminæ strongly curved and zigzagged (suggesting *Lenomys*); inner cusps on first two laminæ large, triangular, with projecting points behind, their tips sticking up high above the well marked valley between them and the median cusps; no internal or "x" cusps on the third lamina; external cusps little developed, about as in *Epimys macleari*. M^2 with antero-internal cusp, large, antero-external obsolete. M^3 with large antero-internal cusp, and two equally projecting salient angles on the internal side behind that cusp. Lower teeth without special peculiarities. Root of lower incisors not projecting in a capsule on the outer side of the mandible.

Genotype.—*Dacnomys millardi*, sp. n.

The proper position of this giant rat is somewhat doubtful. At first I supposed it to be near *Lenomys* and *Lenothrix*, the angularity of the molars and the presence in them of the characteristic connecting points between the laminæ being somewhat as in those genera, to which however there is no external resemblance. But Mr. Hinton has kindly drawn my attention to the fact that certain Eastern species of *Epimys*, notably *E. macleari* and *blanfordi*, have in different degrees, a more or less similar molar structure, *Dacnomys* differing from these mainly by the disproportionate size of the teeth, and the reduction of the zygomatic plate. It would thus appear to form another link in a chain of forms ranging in molar structure from the simplified *Epimys rattus* type, through (1) *E. macleari* and its allies, (2) *Dacnomys*, and (3) *Lenothrix* and *Diplothrix* to (4) the genera with such highly complex zigzagged teeth as those of *Lenomys*, *Crateromys* and *Mallomys*. Concurrent with the greater complexity of the molars there is a reduction in the anterior projection of the zygomatic plate, and except in the two last named genera, an increase in the heaviness of the supraorbital and parietal ridges. As a ready means of diagnosis it may be noted that in every *Epimys*, the length of the teeth goes more than twice in the distance from the back of M^3 to the back of the condyle, while in *Dacnomys* it goes less than twice.

Dacnomys millardi, sp. n.

A large plain looking brown rat with unicolor tail. Size about as in a small bandicoot. Fur of normal character, rather short and thin, hairs of back about 15-16 mm. in length; the longer piles not excessively elongated. General colour above near "olive brown", finely lined with blackish and grizzled with dull buffy. Sides rather lighter. Belly pale brownish, not sharply defined from the colour of the flanks, the hairs pale slaty brown at base, dull creamy white

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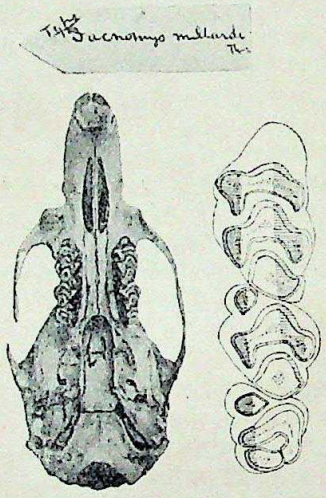
terminally; throat, large axillary patches, and inguinal region creamy whitish to the bases of the hairs. Head rather greyer than back. Ears of medium size, brown. Hands brown to metacarpals, digits whitish; feet dull brown, little lighter terminally. Sole pads large and rounded; fifth hind toe, without claw, reaching to the end of the first phalanx of the fourth. Tail longer than head and body, finely scaled (rings 10 to the centimeter) very thinly haired, the fine hairs not lengthening at the tip; uniformly dark brown above and below to end. Mammæ, 2-2|8.



Skull with long narrow nasals. Supraorbital ridges heavy, but dying away towards the posterior end of the parietals (in the young adult type, broken away in the older specimen). Palatal foramina not quite reaching back to the level of M^1; posterior edge of palate level with the middle of M^3. Bullæ quite small.

Teeth as described above.

Dimensions of type, measured in flesh:—Head and body 228 mm.; tail 325; hindfoot 50; ear 26. (Another older specimen measures, head and body 270; tail 330; hindfoot 53; ear 29).

Skull, greatest length 55; condylo-incisive length 51; zygomatic breadth 25; nasals 21 × 6·2; interorbital breadth 7·6; breadth of brain case 19·5; zygomatic plate 4·8; palatilar length 25; palatal foramina 10·2; upper molar series 11·2, breadth of $M^3$3.

Hab.—Neighbourhood of Darjiling, Sikkim. Type from Gopaldhara, 3,440′, another specimen from Pashok, 3,500′.

Type.—Young adult female. B.M. No. 16.3.25.98 Original No. 41. Collected 6th May 1915, by N. A. Baptista. Presented to the National Museum by the Bombay Natural History Society.

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In general external appearance *Dacnomys millardi* is very like the Tenasserim *Epimys validus*, but there is nothing resembling it in India. I may note that in the original description of *Mus bowersi*, Anderson, a length of the molars series is given which nearly corresponds with that in *Dacnomys*, but this is evidently a misprint, as is evident by the measurements and figure of the skull given later by Sclater.

This fine animal forms the fourth new genus of Muridæ discovered in India by the Bombay Society's Survey, and is by far the most striking of all. Even as a species, that a new rat nearly a foot in length should be discovered near so well known a place as Darjiling is sufficiently astonishing, but that it should represent a new genus makes it a zoological discovery of very special interest. I have connected with this remarkable animal the name of Mr. W. S. Millard, to whose keenness, energy and generosity the Bombay Society's Survey so largely owes the great success it has attained.

2.—A NEW RAT ALLIED TO *EPIMYS SABANUS*, FROM DARJILING.

In company with the two specimens of *Dacnomys millardi* above described, and like them captured by Mr. Lister's coolies, the collection contains a single example of a fine rat representing the *Epimys sabanus* group, not hitherto known from any nearer locality than Trong, in the Malay Peninsular, whence *E. vociferans* was described.

I would propose to name this handsome and unexpected addition to the Indian Fauna

Epimys listeri, sp. n.

Like *E. vociferans* but darker in colour.

Size large as compared with most Indian rats, though smaller than in *E. bowersi*. Fur crisp, not strongly spinous, though mixed with flattened bristles about $\frac{1}{4}$ mm. in breadth and 15 mm. in length. General colour characters as usual in *sabanus* and its allies, that is with a more or less fulvous body, sharply contrasted pale underside and long tail with lighter end. Dorsal colour however darker than in the other species, approaching "mars brown", with but little fulvous suffusion and much blackish lining, sides paler brown; undersurface sharply defined creamy white, the hairs white to their bases. Head greyer than back. Ears large, grey brown, practically naked. Fore limbs greyish brown in front down to the middle line of the metacarpals, digits, sides of metacarpus, and inner aspect of arm white. Hind limb of similar pattern, but the white less extended, confined to the tips of the toes, the edges of the metatarsus and a comparatively narrow line down the front side of the leg, leaving its inner side brown. Tail much longer than head and body, though not so excessively long as in *E. sabanus*, above brown for

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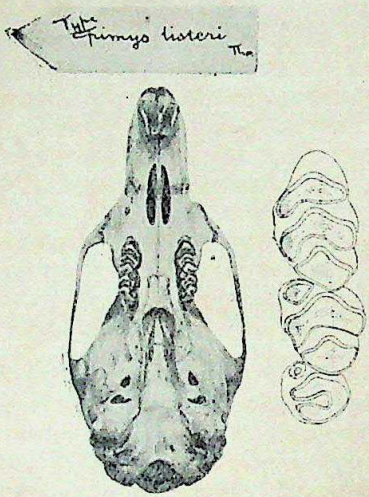
the basal half, both scales and hairs, then quite gradually lightening to white at the tip, the terminal hairs quite white; below the scales are rather lighter proximally, quite white terminally, and the hairs are white throughout; but the limits of change are nowhere sharply defined.



Skull on the whole fairly like that of *E. vociferans*, the brain case rather broader between the parietal ridges; zygomatic plate rather more projected forward; palatal foramina a little longer; molar series rather shorter. Incisors similarly forming a large segment of a small circle, their tips more directed backward towards the throat than in *E. bowersi*, and in fact more than in any other rodent that I have examined.*

* The angle at which the incisors are set in the jaw being a character of considerable systematic importance it might be of use if a method could be found of gauging it accurately, instead of merely stating that they are "thrown forwards" or "turned backwards." I find that if one limb of a small goniometer be placed in the line of the grinding surface of the molars, the angle at which the exposed part of the incisors come down may be fairly accurately measured if the line of the terminal millimeter of their front enamel-clad surface be put close to and parallel with the edge of the other limb. By this method the incisors of *Epimys listeri* may be said to be set at an angle of about 26° or 28° to the line of the tooth row, other members of the same group 28° to 30°, *E. rattus* about 40°—45°, *E. berdmorei* about 45°—50°. A *Rhizomys* comes out at 55°, a *Bathyergus* and a *Nyctocleptes* at 75°, and a *Cannomys* at about 90°, while thrown out beyond the right angle such an extreme form as *Heliophobius* may be measured as 110° to 120°.

These angles cannot be measured within a limit of accuracy of some 5°, more or less, but even so they represent an improvement in the direction of defining the set of the teeth, as compared with any attempt to describe it in words.

Care must be taken that the incisors to be measured are of normal extension, neither accidentally shortened or pushed in on the one hand, nor pulled out or overgrown on the other, as any of these conditions would invalidate the results obtained.

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Dimensions of the type, measured in the flesh :—Head and body 210 mm.; tail 293; hindfoot 47; ear 30. Skull, greatest length 56; condylo-incisive length 51·5; zygomatic breadth 25·3; nasals 22·7; interorbital breadth 8·3; breadth of brain case 21·3; palatilar length 24; palatal foramina 8·2; upper molar series 9.

Hab. of type.—Pashok, Darjiling, 3,500′.

Type.—Adult male. B. M. No. 16·3·25·97. Original number 543. Collected 6th August 1915 by N. A. Baptista. Presented by the Bombay Natural History Society. A second specimen obtained in October.

This rat is at once distinguishable from any of its allies in British India by its conspicuously larger size. Its nearest relative is *E. vociferans* of the Malay Peninsular, from which, as already noted, it differs by its darker colour and the other details above recorded.

That two such distinct and striking new animals as *Dacnomys millardi* and *Epimys listeri* should be discovered in so comparatively well worked a region as Darjiling is most remarkable, and reflects great credit on Mr. R. S. Lister by whose help the Society's collector N. A. Baptista was able to form such a fine series at Pashok, and also to Mr. H. Stevens who gave him so much assistance at Gopaldhara. A full list of these collections will be later given in Mr. Wroughton's "Reports."

3.—On the large rats allied to *Epimys bowersi*.

In Burma and ranging southwards to the northern parts of the Malay Peninsular there occur a number of large iron-grey rats forming the "*bowersi* group" of Bonhote.

Of these rats Mr. Mackenzie has sent from the Chin Hills a very fine series, whose study enables me to clear up several points which had been previously doubtful.

Mr. Mackenzie's specimens prove to be readily separable into two distinct species, a larger, the true *bowersi*, with 2—2=8 mammæ, and a smaller with 3—2=10.

A difference in the number of the mammæ between Tenasserim and Carin examples had already been noticed by me when working out Signor Fea's specimens in 1892, but the size difference in the skulls was not observed, for skulls were comparatively little thought of in those days, and the mammary character was not considered of sufficient constancy to base specific distinction upon.

Later on Mr. Miller described from Trong, in Lower Siam, a species of this group as *Mus ferreocanus*, and the British Museum owes to the authorities of the Federated Malay States Museums examples representing this animal, and fortunately showing the number of the mammæ, which proves to be 2—2=8, as in *E. berdmorei*, not as in the smaller Burmese and Tenasserim species.

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The forms I now recognize may be distinguished as follows :—

A.—Size very large, the skull about 55—57mm. in greatest length. Colour brown, less grey. Mammæ 2—2=8. Upper Burma and Yunnan ... ... *Epimys bowersi*, And.

B.—Size smaller, skull about 53mm. Colour blackish grey ; feet nearly wholly brown. Mammæ 2—2=8. Malay Peninsular ... ... *E. ferreocanus*, Mill.

C.—Size again slightly smaller, skull about 51mm. Colour clearer grey. Mammæ 3—2=10 ... *E. mackenziei*, sp. n.

c^1—Feet averaging shorter. Tail with its end white for about a third or two-fifths of its length. Upper Burma ... *E. m. mackenziei*.

c^2—Feet proportionally longer. Only the tip of the tail white. Tenasserim ... *E. m. feae.*, subsp. n.

Epimys bowersi, And.

The following are the dimensions of a good adult female of this species, sent by Mr. Mackenzie :—

Head and body 246mm. ; tail 268; hindfoot 54 ; ear 34·5. Skull, greatest length 55 (57 in an older specimen), condylo-incisive length 52·5 ; zygomatic breadth 28 ; nasals 22 ; interorbital breadth 8 ; breadth of brain case 21 ; palatilar length 25·8 ; palatal foramina 10·4 ; upper molar series 8·6.

Mr. Mackenzie's specimens were collected in the "Chin Hills, 50 miles west of Kindat ; altitude 5,000′." One example was also obtained by Mr. S. F. Hopwood in 1913 at Kindat itself. Otherwise the only representative of this species in the British Museum had been that from Machi, Manipur, recorded in my list of the Hume Collection (P. Z. S. 1886, p. 62).

Epimys ferreocanus, Mill.

This species has been fully described by Mr. Miller, with the exception of its mammary formula, which I am now able to make out to be 2—2=8, as in *E. bowersi*.

The specimens before me come from Gunong Ijaa, Perak, 4.500′, and were presented by the Federated Malay States Museum through the kindness of Mr. H. C. Robinson.

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The measurements of these specimens may be recorded for comparison :—

Head and body 253mm.; tail 260; hindfoot 53; ear 31. Skull, greatest length 53·7; condylo-incisive length 51·2; zygomatic breadth 26·8; nasals 24·4; palatilar length 25·4; palatal foramina 9·6; upper molar series 9·8.

Epimys mackenziei, sp. n.

Size rather less than in *E. ferreocanus*, therefore considerably less than in *E. bowersi*, found in the same region. Fur thin, sparse, with little underfur, hairs of back about 15mm. in length. General colour of back iron grey (not Ridgway's iron grey, more nearly his "deep purplish grey" but browner) finely grizzled with whitish. Sides lighter grey. Undersurface creamy white, the hairs white to their bases, line of demarcation on sides not very sharply defined. Head like back. Ears large, naked, grey. Hands whitish, more or less brown on the centre of the metacarpals. Feet similarly dull whitish, with some brown on the metatarsals. Tail long, coarsely scaled (about 10 rings to the centimeter) grey-brown above, inconspicuously pale below for its basal three-fifths, then abruptly white all round, scales and hairs, the terminal hairs not markedly lengthened. Mammæ 3—2=10.

Skull, apart from its smaller size, very like that of *E. bowersi*, the braincase proportionally rather smaller, and the bullæ also smaller, the incisors, as in that species, set very vertically, not bent in towards the throat.

Dimensions of the type, measured in the flesh :—

Head and body 234mm.; tail 248; hindfoot 48; ear 30. Skull, greatest length 51; condylo-incisive length 49·4; breadth 26·4; nasals 20·5; interorbital breadth 7; breadth of brain case 19·3; palatilar length 24·7; palatal foramina 9·5; upper molar series 8·8.

Hab.—Chin Hills. Type from 50 miles west of Kindat, 5,000′.

Type.—Adult female. B. M. No. 16.3.26.65. Original number 340. Collected 26th April 1915 by J. M. D. Mackenzie and given by him to the Bombay Natural History Society. Presented by the Society to the National Museum. About a dozen specimens examined.

It is to Mr. Mackenzie's fine series that the discrimination of this species is due, and I have much pleasure in connecting his name with it. An earlier specimen from the Khasia Hills was in Mr. Blanford's collection, but owing to its having no skull, was never definitely determined.

Further south again Signor Fea obtained the specimens I referred with some doubt to *Mus bowersi*, but renewed examination shows that they may be considered as a special subspecies of the present animal.

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Epimys mackenziei feæ, subsp. n.

Size of body slightly less than in true *mackenziei*, but tail and feet averaging longer. Colour apparently about as in true *mackenziei*, except that there is rather more brown on the feet. Tail with only its extreme tip (8 mm. in the type) white, instead of its terminal two-fifths.

Skull essentially as in *mackenziei*, but zygomatic plate rather narrower, palatal foramina less open, bullæ rather smaller.

Dimensions of the type, measured on the spirit specimen :—Head and body 215 mm.; tail 261 ; hindfoot 51 ; ear 26. Skull, greatest length 50·5 ; condylo-incisive length 49 ; zygomatic breadth 25 ; nasals 20 ; interorbital breadth 7·8 ; breadth of braincase 19 ; palatilar length 24·5 ; palatal foramina 9 ; upper molar series 9.

Hab.—Thagata, Muleyit Range, Tenasserim.

Type—Adult female. B.M. No. 88.12.1.47. Collected by L. Fea and presented to the British Museum by the Marquis G. Doria.

Another specimen, now in the Museo Civico, Genoa, had a tail 285 mm. in length (measured from anus) and hindfoot 52.

4.—THE RATS OF THE *EPIMYS BERDMOREI* GROUP.

Mr. Mackenzie obtained in the Chin Hills a fine series of the grey rat, coloured somewhat as in *E. bowersi* and *mackenziei*, but far smaller, which I recorded as "*Mus berdmorei*, Blyth" on Hume's specimens from Manipur.

In working these out I have had before me practically all the known specimens pertinent to the question, namely, (1) by the kindness of the authorities at Calcutta, the typical skull from Mergui, collected by Berdmore and described by Blyth, (2) Hume's specimens from Manipur, (3) one of the two specimens in the Fea collection, recorded by me as *Mus berdmorei* in 1892, now, by Dr. Gestro's help, transferred in exchange to the British Museum, (4) the type of *Epimys berdmorei magnus*, Kloss, recently described from S.-E. Siam, and (5) Mr. Mackenzie's series from the Chin Hills.

Study of this valuable material shows that there are in the group no less than four definable forms, namely, a distinct species in the North (to which 2 and 5 of the above list belong) and three subspecies of *E. berdmorei* in the South (1, 3 and 4).

These four forms are all very similar externally, though there is some difference in the amount of white on the tail. All have 3-2=10 mammæ, and the same general colour.

The skulls are all of the same characteristic shape (see Kloss's figure, P.Z.S., 1916,) with whitish or pale yellow incisors, these being much thrown forward, their angular relation to the molar series, measured as described above, about 70°-75° in the northern form, 80°-85° in the southern ones.

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The different forms I recognize may be sorted as follows :—

A. Bullæ quite small, little swollen. Incisors less thrown forward. Upper molars series 6·0-6·2 mm. Skull 38-40 mm. Tail end white all round. Manipur and Chin Hills ... ... *E. manipulus*, sp. n.

B. Bullæ large and much swollen. Incisors more thrown forward. Tail end dark above ... ... *E. berdmorei*, Blyth.

a. Upper molar series 6·0 mm. Skull 39 mm. N. Tenasserim ... *E. b. mullulus*, subsp. n.

b. Molar series 6·5 mm. Mergui... *E. b. berdmorei*, Bly.

c. Molar series 6·8* mm. Skull 46 mm. S.-E. Siam ... ... *E. b. magnus*, Kloss.

The typical skull of *E. berdmorei* being broken, with the bullæ lost, I have had to make an assumption about the size of its bullæ. But both for geographical reasons and on account of the size of the space in the bone from which the bullæ have fallen, it seems fairly certain that they were of the large type, as in the Muleyit and Siamese races, not as in that further North in Manipur.

Epimys manipulus, sp. n.

Grey above, white to the bases of the hairs below. Hands and feet white above, the latter sometimes browner proximally. Tail with its terminal two-fifths to a half white all round, the proximal portion being brown about and whitish below.

Skull in general characters as in *E. berdmorei*, but the incisors rather less thrown forward and the bullæ conspicuously smaller. Molars small, as in the smallest-toothed race of *E. berdmorei*.

Dimensions of the type :—Head and body 182 mm.; tail 181; hindfoot 37; ear 24·5; weight 5 oz. Skull, greatest length 42; condylo-incisive length 40·5; zygomatic breadth 22; nasals 17·5; interorbital breadth 7; palatilar length 20; palatal foramina 8; upper molar series 6·0.

Another fully adult skull measures only 39 mm. in greatest length.

Hab.—Manipur and Chin Hills. Type from Kabaw Valley, 20 miles W. of Kindat, Upper Burma. Alt. 600′.

Type.—Adult female. B.M. No. 16. 3. 26. 78. Original number 172. Collected 30th January 1915 by J. M. D. Mackenzie, and given by him to the Bombay Natural History Society. Presented to the National Museum by the Society. About 40 specimens examined.

This Upper Burma rat is readily distinguishable from all the forms of *E. berdmorei* by its small bullæ and white tail-tip.

*Mr. Kloss appears to have measured the teeth on the alveoli. I always include the crowns only, from the most anterior part of the enamel covered surface.

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Epimys berdmorei mullulus, subsp. n.

Size smaller than in other forms. Colour apparently as in true *berdmorei*, but as the specimen has been preserved in spirit, an exact description of its colour is not possible.

Tail brown above, scarcely lighter below; its extreme end has apparently been lost during life, and may have been either brown or white, but was most probably the former.

Skull smaller than in *berdmorei*, which in turn is smaller than that of *magnus*; the shape rounder and more solidly built than in the former, the muzzle and interorbital region proportionally broader. Bullæ, while still of the large size found in this species as compared with *E. manipulus*, smaller than in *magnus*, those of the true *berdmorei* unknown. Palatal foramina narrowed, far less widely open than in the other forms. Molar teeth very small.

Dimensions of the type, measured on the spirit specimen:—

Head and body 170 mm.; tail 140 + (*c*) 5; hindfoot 33; ear 21·5. Skull, greatest length 39·2; condylo-incisive length 39; zygomatic breadth 21·8; nasals 14; interorbital breadth 6·8; palatilar length 19·7; palatal foramina 8; upper molar series 6·0.

Hab.—Muleyit Range, Tenasserim. Type from Thagata.

Type.—Adult female in spirit. B. M. No. 16. 2. 16. 1. Collected by L. Fea. Received in exchange from the Museo Civico, Genoa.

While we have available for examination a very fine series of the northern *E. manipulus*, the three sub-species now recognized of *E. berdmorei* are only represented by a single specimen each, but these are so different from each other by the characters above recorded that there can be no doubt they should have distinct varietal names.

5.—A new Mouse from Sikkim.

Thanks to the material obtained by Mr. Crump in Sikkim for the Bombay Society's Survey I am now enabled to make a definite determination of a mouse which has been known to us by imperfect specimens for a very long time. It is the "*Mus nitidulus*" of my paper on Indian Rats and Mice, 1881, (P. Z. S., 1881, p. 550), but as was indicated when some Mt. Popa *Muridæ* were described recently (Journ. Bombay N. H. Society, XXIII, p. 30, 1914), is certainly not that species, and does not appear to be referable to any known form. It may be called

Mus pahari, sp. n.

Size large, one of the largest species of restricted *Mus*. Fur crisp, liberally mixed with spines; hairs on back about 7-8 mm. in length. General colour above greyish buffy, lined with blackish, the tips of the ordinary hairs buffy, of the spines black; basal seven-eighths of the fur slaty grey, but some of the specimens are

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wholly slaty greyish on account as I believe, of the wearing off of the buffy tips to the hairs. Under surface greyish white, not sharply defined laterally, the hairs slaty basally, greyish white terminally. Ears of medium size, grey. Hands and feet dull white, the metapodials in some specimens brownish. Tail about the length of the head and body, finely scaled (17 rings to the cm.), very thinly haired, dark greyish above, inconspicuously lighter below. Mammæ 3—2=10.

Skull, as compared with that of Burmese *M. nitidulus*, decidedly larger, with large, smooth brain-case. Interorbital region very broad, its edges quite without ridges, hardly squared even in old specimens. Palatal foramina rather short, not or barely reaching back to the level of m.[1] Back of palate about level with hinder edge of m.[3]

Dimensions of the type, measured in the flesh:—Head and body, 94 mm.; tail, 91; hindfoot, 20; ear, 15. Skull:—Greatest length, 25·1; condylo-incisive length, 23·2; zygomatic breadth, 12·7; nasals, 10·1; interorbital breadth, 5; breadth of brain-case, 11·5; palatilar length, 10·5; palatal foramina, 5; upper molar series, 3·9.

Habitat—Sikkim. Type from Batasia, Tonglu. Alt. 6,000′. Other specimens from Chuntang, 5,350.′

Type.—Adult male. B. M. No. 15. 9. 1. 199. Original number, 6419. Collected 1st March, 1915 by C. A. Crump. Presented to the National Museum by the Bombay Natural History Society.

The material examined consists of four specimens obtained by Mr. Crump; one from "Sikkim," 4,500′, purchased of the dealer Argent in 1848; and one in spirit from Darjiling, presented by Mr. W. T. Blanford in 1880.

This species is readily distinguished by its comparatively large size, crisp fur, large unridged braincase with broad interorbital space, and shortened palatal foramina.

I may perhaps here express my pleasure that these Survey specimens have at last thrown light on the characters of a species which has been a puzzle to me ever since I first began working on Indian *Muridæ*.

B.—Two New Indian Bats.

By Oldfield Thomas.

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Pipistrellus cadornæ, sp. n.

Allied to *P. kitcheneri*, Thos., but darker coloured.

General external appearance somewhat as in *P. ceylonicus*, but essential characters more as in *P. kitcheneri*. Size rather less than

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in the latter species. Fur practically confined to body; hairs of back about 5·5 mm. in length. Colour much darker, the upper surface dark bistre brown, lower surface paler brown, the hairs everywhere blackish slaty for their basal halves, their ends brown, ears broad, triangular, their tips rather narrowly rounded off; tragus short, very broad, shape quite as in *kitcheneri*. Wing membranes blackish throughout, not reticulated greyish as in *kitcheneri*.

Skull shorter and more rounded than in *kitcheneri*, nasal notch similarly broad. Basial pits present, fairly deep, but not so sharply defined as in *kitcheneri*. Teeth as in that species, the incisors of the same size and relative proportions, the anterior premolar similarly very minute, and the posterior one similarly close up to the canine. In the lower teeth again there appears to be no definable difference between the two.

Dimensions of the type, the italicized measurements taken in the flesh:—

Forearm 33 mm.

Head and body 48; *tail* 49; *ear* 15; tragus (dry) 3·5 × 2·7; third finger, metacarpus 32, first phalanx 13·8; fifth finger, metacarpus 30, first phalanx 8·7; lower leg and hindfoot, c. u. 22·3.

Skull, greatest length 13·2; basi-sinual length 9·7; breadth of brain case 7·2; front of canine to back of M^3 4·9; front of P^4 to back of M^2 3·3.

Hab.—Darjiling, type from Pashok, 3,500′.

Type.—Adult male. B. M. No. 16.3.25.6 Original number 412. Collected 19th July 1915 by N. A. Baptista, and presented to the National Museum by the Bombay Natural History Society.

This species is distinguishable from *P. mordax*, the only Indian bat with a similarly broad tragus, by its shorter skull, its much smaller P^1 and the absence of the characteristic black and hoary coloration. From *P. ceylonicus* by its comparatively still smaller P^1, its broader tragus and deep brown colour. From *P. imbricatus*, if it occurs in India, it differs by its considerably greater size, and finally from the Bornean *P. kitcheneri* by the various characters mentioned in the description above, notably the darker colour of the fur and wing membranes, and its smaller size.

It is named in honour of General Count Luigi Cadorna, the Commander-in-Chief of our Italian Allies.

Kerivoula lenis, sp. n.

Closely allied to *K. papillosa*, but with smaller skull and teeth.

Size rather less than in *papillosa*.

General colour as in that species, but the head more whitish buffy, and the hairs of the back with their basal three-fifths dark slaty blackish; in *papillosa* only the bases are darker, and that not so strongly. Ears of the same general shape as in *papillosa*, but the projection

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near the base of the outer margin of the tragus is far longer and more pointed; in the seven specimens of *papillosa* available this projection is quite small and inconspicuous.

Skull with markedly shorter muzzle, smaller teeth and narrower palate than in *papillosa*, all the specimens of which are quite uniform in these respect.

Dimensions of the type, measured on the skin :—

Forearm 41.

Third finger, metacarpus 42·5; first phalanx 20; lower leg and hindfoot c. u. 29. Skull, zygomatic breadth 8·7; interorbital breadth 3·2; palato-sinual length 7·2; front of canine to back of M^3 6·7; premolars only 2·2; breadth across outer corners of M^2 6; tip to tip of canines 3·3.

Hab.—Calcutta.

Type.—Adult skin and skull. B. M. No. 79.11.21.126. Presented by J. T. Pearson, Esq., to the India Museum, whence it was transferred in 1879.

This bat was referred to in Blanford's Mammals of India (p. 341), but presuming on its identity with the Malay *K. papillosa* doubt was thrown on its asserted locality. Now however that it proves to be different, the locality may be provisionally accepted as correct.

C.—On Squirrels of the Genus Dremomys.

By Oldfield Thomas.

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The Chindwin collections of Messrs. Mackenzie, Shortridge and Macmillan contain examples of no less than four different species of *Dremomys*, and after determining them I have thought it might be useful to give a synopsis of the British Indian forms of this striking genus.

A. Cheeks not ferruginous. Tail dully coloured, grizzled.
- *a.* Belly hairs strongly buffy or ochraceous terminally.—Ear patches ordinarily whitish ... ... *D. lokriah.*
  - *a²*. Belly washed with rich ochraceous ("ochraceous orange"). Back without the slightest trace of a median line.
    - *a³*. General colour browner. Nepal and Western Sikkim ... ... *D. l. lokriah.*

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*b*³. General colour darker and more olivaceous. Eastern Sikkim... ... ... *D. l. bhotia.*

*b*². Belly washed with buffy or yellowish. A darker line on back, though very faint in faded pelage. Manipur and Chin Hills ... ... *D. macmillani.*

b. Belly hairs whitish or creamy terminally. Ear patches ordinarily ochraceous. Chin Hills (Eastwards into China) ... *D. pernyi.*

B. Cheeks, and middle area of tail below, bright ferruginous.

a. Size larger. Colour darker ... ... *D. rufigenis.*

*a*². Upper Chindwin ... ... *D. r. opimus.*

*b*². Tenasserim ... ... *D. r. rufigenis.*

b. Size smaller. Colour paler. Chindwin and Shan States ... . *D. r. adamsoni.*

In *D. macmillani* there appears to be a great difference in the prominence of the dark dorsal line between specimens before and after the spring moult, so that at one time I supposed the pre-moult specimens to be examples of a local form of *D. lokriah* with yellow bellies and a faint darker dorsal stripe. But closer examination convinces me that the two apparent forms are really seasonal changes of one and the same. The strongly lined post-moult form, *macmillani* as described, has its dorsal stripe sharply marked, and has the hairs of its ear patches more or less ochraceous terminally. Later on in the season the hairs of the stripe lose their distinctness by fading, while the ends of the hairs in the postauricular spots apparently fade or wear off so as to result in a more or less whitish ear patch, similar to that of *D. lokriah.*

In the skull there is absolutely no difference between *D. lokriah* and *macmillani*, so that it may be a question whether the latter should not rather be considered as a local subspecies of the former. But until intermediate specimens turn up it seems better to leave things as they are.

Dremomys pernyi, characterised by its whitish belly, is a new addition to the fauna of British India, its previously known range extending from Yunnan to Fo-kien and An-hwei, Eastern China.

With regard to *D. rufigenis* I now merely repeat the characters already used in describing the three subspecies, as it is evident that further study of the group is necessary. Attention may, however, be drawn to the really remarkable resemblance between the *D. r. opimus* of Hkamti, in the far north of the Chindwin and the true *rufigenis* of Tenasserim, while all the forms between them, representing *D. r. adamsoni*, are so different that they should perhaps be specifically separated.

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D.—The Squirrels of the *Tomeutes lokroides* and *mearsi* Groups.

By Oldfield Thomas, F.R.S. and R. C. Wroughton.

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The receipt of the fine series collected by Mr. Mackenzie, I.F.S., on the Chindwin, and Messrs. Crump and Baptista, in Sikkim, has caused us, after a further examination, to modify the results before arrived at and recorded in Vol. XXIV, p. 224, *et seq.*

It is now clear that, while some classification is possible in dealing with the summer forms, in which the characteristic thigh-patch is present, the identification of specimens in winter pelage, when there is no thigh-patch, is often difficult or impossible.

The following is a key to the forms we are now able to recognize, based on their summer pelage.

Key.

A. Feet dark grey, thigh-patches red... *lokroides* group.
- *a.* No grey median line on chest and abdomen ... ... *lokroides lokroides* (Hodgson. (Sikkim).
- *b.* A grey median line on chest and abdomen ... ... *lokroides owensi*, T. and W. (Upper Chindwin, East Bank.)

B. Feet pale, thigh-patch white or buffy. *mearsi* group.
- *a.* Thigh-patch pure white... ... *mearsi virgo*, subsp. nov. (Upper Chindwin, West Bank.)
- *b.* Thigh-patch white edged by an ochraceous flush ... ... *mearsi bellona*, subsp. nov. (Kin, Middle Chindwin.)
- *c.* Thigh-patch buffy white ... *mearsi mearsi*, Bonhote. (Chinbyit, Lower Chindwin.)

T. lokroides Group.

In the paper referred to above we recorded under the heading of *Tomeutes lokroides*, Hodgson: "Squirrels representing this long known Nepalese and Sikkim species occur all down the West Bank of the Chindwin . . . . . The Upper Chindwin form does not at present appear to be separable from true *T. lokroides*. But about this we shall know more when the Society's Survey Collections from

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Sikkim arrive." Now that they have arrived we see that it is separable.

All the old specimens of *T. lokroides* from Nepal and Sikkim were undated and not exactly localised, but with the new material to help us, we are able to record that what has hitherto been known as *similis*, Gray, characterized by its reddish thigh-patch is in fact the summer pelage of *lokroides*, Hodgs. Consequently the form described as *T. similis owensi* (l.c.) must in future be known as *T. lokroides owensi*. It is interesting to note its location on the East Bank of the River, near its source. The other forms dealt with in the passage quoted above, all found on the West Bank of the Chindwin only, fall into the quite distinct *mearsi* group, dealt with under the next heading.

T. mearsi Group.

Bonhote described *mearsi* as a subspecies of *lokroides* and it has been so accepted until now. The abundant material we have just received, however, shows that there is a group of forms, inhabiting the West Bank of the Chindwin River, which possess in common certain distinctive characters separating them entirely from *lokroides*, notably the white feet, white thigh-patch and smaller skull, and we have been unable to detect any signs of intergrading between the two. Consequently *mearsi* may be accepted as a species.

Tomeutes mearsi, Bonh.

The name was based on a series of four specimens, including the type, taken by Col. Mears at a place called Chinbyit, which appears to be close to Monywa, on the Lower Chindwin, about 50 miles below Kin. Unfortunately the specimens are all in winter pelage, without thigh-patches. The general colour is a pale, grizzled grey, entirely without any trace of brown or red. In the collection received from Mr. Mackenzie are two specimens killed in October, of the same 'cold' pale grey colour, labelled "150 miles south of Kindat," which presumably is not far from the type locality of *mearsi*, and we, therefore, accept them as indicating, to some extent, the summer pelage of *mearsi*. They show pale buffy white thigh-patches, evidently disappearing. Good specimens of *mearsi*, taken in full summer, at or near Monywa, are a great desideratum.

Tomeutes mearsi bellona, subsp. nov.

A fine series collected by Mr. Shortridge at Kin, and provisionally accepted by us (l.c.) as the summer form of *mearsi*, now requires a name. The following is a description of this form, of the winter pelage of which we have no example. A good series of winter specimens from Kin are very much to be desired and we hope some member will oblige.

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Colour above grizzled black and yellow, giving the general appearance of olivaceous grey, the individual hairs ringed yellow and black. The posterior back and often the flanks as far as the forelegs washed with "orange rufous," the outside of the thighs entirely that colour with a white thigh-patch. Below "ochraceous buff." Forefeet grizzled like the head, hindfeet buff with a median grey line.

Dimensions of the type.—Head and body, 184 mm; tail, 176; hindfoot, 43·5; ear, 18·5. Skull.—Greatest length, 46; condylo-basal length, 39·5; zygomatic breadth, 27; upper tooth row exclusive of p^3, 8·7.

Hab.—Kin, Lower Chindwin River.

Type.—Adult male B. M. No. 15. 5. 5. 177. Original number 5453. Collected by Mr. G. C. Shortridge, on the 18th June, 1914. Presented to the National Collection by the Bombay Natural History Society.

Tomeutes mearsi virgo, subsp. nov.

This is the Upper Chindwin form (ranging from Kindat northwards to Hkamti) which, pending receipt of Sikkim specimens of true *lokroides*, we did not venture to separate from that species, but it is now clear that they belong to the *mearsi* and not to the *lokroides* group. The following is a description of this form, of which Mr. Shortridge obtained over 40 specimens in summer pelage and Mr. Mackenzie has now sent nearly 30 of the winter form.

General colour above a grey grizzle (the individual hairs ringed white and black) slightly tinged with brown in the winter, much more markedly so in the summer form. This latter with a pure white thigh-patch below buff. The feet like the ground colour of the body in winter, but much paler, usually buffy white, in the summer form.

Dimensions of the type.—Head and body, 180; tail 160; hindfoot, 43; ear, 20. Skull.—Greatest length, 48; condylo-incisive length, 42; zygomatic breadth, 28·5; upper tooth-row exclusive of p^3, 8.2.

Hab.—Upper Chindwin (West Bank) from Kindat to Hkamti. (Type from Tatkon).

Type.—Adult male B. M. No. 15.5.5.169. Original number 5629. Collected by Mr. G. C. Shortridge on the 5th July, 1914. Presented to the National Collection by the Bombay Natural History Society.

To make clearer these changes in determination, we may recapitulate that our previous

T. lokroides lokroides from Nepal = *T. lokroides lokroides* (Winter).

T. lokroides lokroides from Upper Chindwin ... ...= *T. mearsi virgo* (Summer).

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T. similis from Nepal	...	...= *T. lokroides lokroides* (Summer).
T. similis owensi ...	.	...= *T. lokroides owensi.*
T. lokroides mearsi	...	.. = *mearsi mearsi* and *m. bellona.*

E.—A new Flying Squirrel from Tenasserim.

By Oldfield Thomas.

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Among the Flying Squirrels obtained for the Survey by Mr. G. C. Shortridge in Tenasserim is one which is so like the examples he obtained there of *Pteromys* (*Hylopetes*) *belone* that it was not distinguished from them until recently. Now, however, examination shows that it is not a *Hylopetes* at all, but a most distinct species of the subgenus *Petinomys* and therefore in no way related to *P. belone*. It may be called

Pteromys (*Petinomys*) *phipsoni*, sp. n.

A *Petinomys* with the general look of *P.* (*Hylopetes*) *belone*, though the size is smaller.

General colour above blackish slaty, washed with fulvous or cinnamon, which becomes deeper and richer on the posterior back. Under surface cream-buff, whiter mesially. Top of muzzle and crown slaty greyish with fine buffy tips to the hairs; eyes with a broad deep black line running along above them from the base of the ears to the roots of the whiskers, a narrower black line edging them below. Below this narrow black line the cheeks are bright ochraceous-buffy, this colour passing down on the sides of the throat and chest, where it fades into the general cream-buff of the under surface; the middle line of the throat white. Ears very small, with tufts of long black hairs, twice the length of the ears, growing from their anterior and posterior bases. Hands and feet dark brown above, cream-buff on the inner sides of the wrists and ankles. Tail distichous, dull buffy for its basal inch above, then smoky brown darkening to black at the end; below the basal inch is buffy, then the sides are mixed buffy and brown, the buffy then disappearing and the terminal half being black; middle line of vertebræ buffy, edged with dark brown.

Skull with all the characteristics of *Petinomys*, the brain-case broad, smooth and strongly bowed, the profile very convex upwards; bullæ large, triangular, flattened, very different to the round inflated bullæ of *Hylopetes*.

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Dimensions of the type, measured in flesh:—

Head and body, 123 mm.; tail, 116; hindfoot, 24; ear, 14·5.

Skull:—Greatest length, 31; condylo-incisive length, 29·2; zygomatic breadth, 18·6; nasals, 7·8 × 4·3; interorbital breadth, 6; mastoid breadth, 17; palatilar length, 13; upper tooth series exclusive of p. ^{3}, 5·2.

Habitat—Tenasserim; type from Tenasserim village.

Type.—Adult female. B. M. No. 14.12.8.243. Original number, 5050. Collected 10th April 1914 by G. C. Shortridge. Presented to the National Museum by the Bombay Natural History Society.

Like as this species is to *P.* (*Hylopetes*) *belone* and its allies, within the subgenus *Petinomys* it is so widely distinct from any described form as to need no detailed comparison. Perhaps its nearest relation is *P. setosus*, Temm., but that has none of its striking colour characteristics.

I have named this beautiful little animal in honour of Mr. H. M. Phipson, the former Secretary of the Society, to whose initiative and enthusiasm the Society owes so much of its prosperity, and to whose ready help most Indian Zoologists have at various times been so greatly indebted.

F.—A new Flying Squirrel from the Chin Hills.

By O. Thomas, F.R.S. and R. C. Wroughton.

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In Mr. Mackenzie's collection there are two specimens, adult and young, of a new Flying Squirrel, widely different from any known Indian one, and only related to Yunnan and Malayan forms. It may be called

Petaurista sybilla, sp. n.

A small species nearly related to *P. marica*, Thos. Size, as gauged by skull, slightly less than in *marica*. Fur fine and soft, wool hairs of back about 27mm. in length, the longer hairs attaining 36. Coloration nearly similar to that of *marica*, but practically without white spots, a single one only present on the right hip of the type. Dorsal area grizzled ochraceous tawny, more olivaceous anteriorly, deeper tawny posteriorly. Parachute brilliant rufous. Under-surface bright ochraceous buff, edged with the brilliant rich rufous of the parachute; a black spot on the chin. Head rather more tawny than back, not blacker as in *marica*, a narrow blackish edge along the upper side of the orbits continued forward towards the muzzle;

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a spot at base of whiskers blackish. Postauricular patch large, prominent, brilliant ochraceous rufous. Hands and feet rich tawny rufous; a few brown hairs at the base of the claw of the hallux. Tail tawny rufous, the basal fourth of the hairs slaty; tip of tail with a few black hairs.

Skull rather smaller than that of *marica*, the teeth, on the contrary, rather larger. General characters, and noticeably the smoothness and roundness of the braincase, quite similar.

Dimensions of the type (measured by Mr. Mackenzie in the flesh).—Head and Body, 341 mm.; tail, 341; hindfoot, 62; ear, 39. Skull.—Greatest length, 61; condylo-incisive length, 55·5; zygomatic breadth, 41·5; nasals, 18 × 11·5; palatilar length, 27·5; palatal foramen, 4; upper molar series, exclusive of p^3, 13·3.

Hab.—Chin Hills, 50 miles, West of Kindat. Alt. 5,000 feet.

Type.—Adult female B. M. No. 16.3.26.14. Original number 349. Collected 26th April 1915 by Mr. Mackenzie, I.F.S. Presented to the National Museum by the Bombay Natural History Society. Two specimens, adult and young, obtained.

This beautiful Flying Squirrel is named in honour of Mrs. Millard, wife of the Society's Honorary Secretary. It represents a group of the genus not hitherto found in British India, its only near relations being the *P. marica* of Yunnan, and *P. punctatus* of Malacca, species which, as noted in the description of the former, differ widely from the ordinary heavy-skulled members of *Petaurista*, and approach some of the larger species of *Pteromys** (subgenus *Hylopetes*). It is undoubtedly most nearly allied to *P. marica*, but differs by the practical absence of white spots, by its head not being more blackish than its back, by the greater size of the postauricular patches, and by its feet being almost wholly rufous. Hereafter intermediate links may be found to occur, but for the present we cannot assume their existence, and therefore use a binomial name for it.

G.—New Rodents from Sikkim.

By R. C. Wroughton.

1.—A new *Callosciurus* of the *erythraeus* group.

In the Sikkim Collection, Mr. Crump obtained a squirrel, of which there is no representative in the National Collection, and which, so far as I can discover, has never been described. I propose to call it after Mr. Crump, who has done such good and successful work for the Mammal Survey.

* That is of *Sciuropterus*, as they have been called until recently.

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Callosciurus crumpi, sp. n.

A *Callosciurus* of the *erythraeus* group, but differing from all other members of it in having the underparts not red, but grizzled more or less like the back.

Size as in *erythraeus*. Fur soft and close, about 15-20 mm. long on the back.

General colour above a grizzle of black and yellow, giving a general olivaceous effect, finer on the flanks, coarser on the dorsal area where also the yellow element in the grizzle becomes a bright "ochraceous." The individual hairs black, with three rings of "ochraceous" or "ochraceous buff," the under fur "slate colour." Below grizzled like the flanks, but still more finely, the lateral areas of the abdomen more yellow than the median darkening posteriorly, until the inguinal area is almost "hazel." Face in front of the eyes "ferruginous." Feet finely grizzled. Tail grizzled like the back, but more coarsely for three-fourths of its length, the remainder forming a black tassel.

Skull as in *erythraeus*.

Dimensions of the type:—Head and body, 205; tail, 193; hindfoot, 49; ear 20 mm. Skull:—Greatest length, 53; condylo-basal length, 48.5; brain case breadth 24; interorbital breadth, 19·5; nasals length, 16; cheek teeth, 11; diastema, 11·5.

Habitat.—Sedonchen, Sikkim. 6,500 ft.

Type.—Adult male. B.M. No. 15.9.1.103. Original number, 5785. Collected by Mr. C. A. Crump, on the 17th November, 1914, and presented to the National Collection by the Bombay Natural History Society.

Mr. Crump obtained altogether eight specimens, all at the same place, and he did not I understand see the species anywhere else.

2.—A NEW *DREMOMYS* FROM SIKKIM.

In the Sikkim Collection, Mr. Crump obtained a series of 24 specimens of *Dremomys*, 11 from the west, and 13 from the east of the Tista River. On laying these out it was at once apparent that there were present two distinct forms, the one from the west of an olive colour, strongly suffused with bright ochraceous, the other from the west of a dark grey, almost black colouring. Each of these series is remarkably constant in colouring, specimens from places so close together as Lachen and Chuntang being as markedly distinct as some from Sukiapokhri, on the Nepal border, from others from the neighbourhood of the Jelap La on the Bhotan frontier and nowhere is there any trace of "intergrading." Unfortunately there is one specimen labelled "Sedonchen" which is quite indistinguishable from west Sikkim specimens. Personally I am of opinion that this is due to some unfortunate mistake in

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labelling, but, until we have proof that this is so, I do not feel justified in ranking the new form as other than a subspecies of *lokriah*. The western series corresponds in all particulars with Hodgson's co-types of that species and with a series of about a score of other specimens collected by Hodgson in Nepal, and by Blanford and others in Sikkim. It may therefore be confidently accepted as true *lokriah*. The eastern series I propose to call

Dremomys lokriah bhotia, sp. n.

A *Dremomys* resembling *lokriah* in all structural characters, but lacking entirely the suffusion of ochraceous which marks that species.

Size and fur quite as in *lokriah*. General colour above darker than in true *lokriah*, the grizzle much finer. The individual hairs black, with a subterminal ring (about 1mm.) of "ochraceous buff," in *lokriah* the hairs have two rings, each of them double the width of the single ring in the present form. The face in front of the eyes and feet show an excessively fine grey grizzle, without any sign of yellow. Below bright "ochraceous" as in *lokriah lokriah*.

Dimensions (recorded by the collector):—Head and body, 171; tail, 134; hindfoot, 44; ear, 21. Skull:—Greatest length, 50·5; condylo-basal length, 45; nasals, 15; diastema, 13; cheek teeth, 8·5.

Habitat.—Eastern Sikkim, the type from Sedonchen.

Type.—An adult male. B. M. No. 15.9.1.125. Original number, 5775. Collected by Mr. C. A. Crump, on the 14th November, 1914, and presented to the National Collection by the Bombay Natural History Society.

With the Chindwin Collection we received two specimens (unfortunately both immature) from the Chin Hills which seem to belong to the present race, but on the other hand there are two specimens from Manipur, collected by Hume, which correspond the one with *lokriah lokriah* and the other with *lokriah bhotia*. However until we have more material from Assam, there is little use in speculating on the distribution of the two races.

3.—The Rats of the *fulvescens* group in Sikkim.

Epimys fulvescens was described by Gray, from Nepal, in 1846. Hodgson gave it the names *caudatior* and *octomammis*, but both these names were later in date and moreover were *nomina nuda*. In 1863, Blyth described *jerdoni* on a specimen collected in Sikkim by Dr. Jerdon, his description is very brief, and though his type is not available to me for examination, his description so closely parallels that of Gray that I have no doubt in considering it as identical with *fulvescens*, of which *jerdoni* is therefore a synonym.

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A second species from Nepal was named and described under the name *niviventer*, by Hodgson, in 1836. In the Kumaon Collection we received specimens of this rat which agreed well with Hodgson's type, in all these the underside was entirely pure white. We have now, in this Sikkim Collection, a series of a rat which, while closely resembling *niviventer* in most characters differs in having a dark area on the middle of the back, from forehead to tail, and in having a collar, which is extended in the median line, the whole length of the abdomen, of the same colour as the back. I add below a description of this animal under the name *Epimys lepcha*.

Finally Mr. Crump obtained a series of a small rat which I believe to be undescribed and I add a description of it under the name *Epimys eha*.

The following key may help in discriminating between the members of this group of Nepal-Sikkim rats. I may note here that we have received in our Collections from Burma some individuals of this group which are recorded in the reports as *Epimys jerdoni*, but from what I have said above it is evident that they have been wrongly labelled. I would have included them in this review of the group were it not that there is a species, *cinnamomeus*, named by Blyth from Shwe-gyen, of which we have no specimen for reference :—

KEY.

A.—General colour above "ochraceous."

a. Larger, head and body, 130-140, skull, 36. Under surface pure white ..... *E. fulvescens*, Gray.

b. Smaller, head and body, 110-115, skull, 32. Under surface greyish, individual hairs slate with white tips ..... *E. eha*, sp. n.

B.—General colour above greyish brown, "hair brown."

a. Under surface pure white... *E. niviventer*, Hodgson.

b. Dark gorget and median streak on abdomen ... *E. lepcha*, sp. n.

Epimys eha, sp. n.

A rather small species of the *fulvescens* group, recognisable among all the other species of the group by the black 'spectacles' round the eyes and the long close hair of the under surface, the individual hairs being slate coloured with short white tips, giving a general grey effect.

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Fur above finer, softer, and closer than in *fulvescens*, not longer (about 5 mm.), entirely without spines. General colour above bright "clay colour," not quite so bright as "ochraceous," darker and duller in the middle region of the back; below greyish white; (all the hairs dark slate colour at their bases, tipped with ochraceous on the flanks, and with white on the whole under surface) a sharp line of distinction between the colour of the flanks and that of the under surface. Face with dark rings round the eyes, produced forward to meet in an acute angle at the tip of the nose, the cheeks outside this triangle, and as far back as the eyes, whitish grey like the throat, the remainder ochraceous. The feet dark to the bases of the toes, the toes themselves white. Tail dark above, white below, clothed sparsely with short, adpressed, black hairs, which become very appreciably longer towards the end of the tail, but not enough to form a tuft.

Skull markedly smaller than in *fulvescens*, the supraorbital ridges much less marked, scarcely more than indicated, teeth very much smaller. Zygomatic plates not produced forward, not visible from above.

Dimensions of the type:—(Those of the body taken in the flesh by the collector). Head and body, 115; tail, 186; hindfoot, 26; ear 20. Skull:—Greatest length, 32; condylo-basal length, 29; brain-case breadth, 13·8; interorbital breadth, 5; nasals length, 11; diastema, 8·5; palatal foramina, 6; tooth row, 5.

Habitat.—Sikkim. (Type from Lachen. Alt. 8,800 feet.)

Type.—Old male. B. M. No. 15. 9. 1. 189. Original number, 6107.

Collected by Mr. Crump, on the 30th of December, 1914. Presented to the National Collection by the Bombay Natural History Society. This small rat seems to be widely distributed in Sikkim. Among the 21 specimens obtained, there are individuals from Ghoom and Sukiapokhri in the south, to Thangu (Alt. 10,000 feet) in the extreme north.

I have named this very distinct species in memory of my old friend the late E. H. Aitken, who conjointly with Mr. H. M. Phipson, founded the Bombay Natural History Society. I have used his nom-de-plume "Eha," under which he is known to such a wide circle by his books on the Field Natural History of the Bombay Presidency.

Epimys lepcha, sp. n.

A member of the *fulvescens* group, rather larger than *eha*, with a comparatively shorter tail, most nearly related to *niviventer*, from which it differs most notably by its dark throat and median abdominal line.

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Fur soft and close, without spines. General colour above "hair brown," very dark, almost black along the median dorsal line, more and more tinged with "ochraceous buff" towards the flanks, below pure white, with a collar at the base of the throat, extended backwards along the median line of the abdomen, the same colour as the back, the line of division of the upper and under surfaces, along the sides, sharply marked. Feet white. Tail dark above, pale below, often with a white tip, sparsely clothed with short, adpressed, black hairs, the terminal one-sixth further with longer finer, white hairs.

Skull slightly longer, and markedly narrower than in *fulvescens*, tooth row slightly shorter.

Dimensions of the type:—(Those of the body taken in the flesh by the collector). Head and body, 133; tail, 170; hindfoot, 28; ear, 22. Skull:—Greatest length, 37.5; condylo-basal length, 34; brain case breadth, 14.5; interorbital breadth, 6; nasals length, 15; diastema 9.5; palatal foramina, 6; tooth row, 5.3.

Habitat—Sikkim. (Type from Chuntang. Alt. 5,350 feet.)

Type.—Old female. B. M. No. 15. 9. 1. 185. Original number, 5968. Collected by Mr. Crump, on the 17th December, 1914. Presented to the National Collection by the Bombay Natural History Society.

Mr. Crump obtained this species only at Chuntang and Lachen, at between 5,000 and 9,000 feet altitude, where he got a series of 18 specimens. The specimens of *niviventer* obtained by him in Kumaon were found at about the same altitude. No specimens of *niviventer* were found in Sikkim nor of *lepcha* in Kumaon.

4.—The Local Races of *Funambulus pennanti.*

Some years ago I pointed out in this Journal (Vol. XVI., p. 406, 1905) that *Funambulus palmarum* and *pennanti* were two quite distinct species and at the same time I described a local race of *pennanti*, from Rawal Pindi, under the name of *argentescens*. In the Collections of the Mammal Survey, a large number (more than 250 specimens) of *pennanti* have been received from a dozen different localities and of these only one series turns out to be the northern form *argentescens*, *viz.*, that from Sind, while all the rest have in the Survey Reports been classed as *F. pennanti pennanti*. On laying out all these specimens it became evident that there is another local form, at and round Palanpur, which is quite distinct from both true *pennanti* and *p. argentescens*, I propose to call it

Funambulus pennanti lutescens, sub. sp. nov.

A *Funambulus* rather smaller than true *pennanti*, about the size of *argentescens*, but much paler than either of these two forms.

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Size and fur as in *argentescens*. General colour above pale 'cream buff' on the flanks, the saddle near 'mars brown' (individual hairs 'cinnamon' with dark bases and tips, mixed with quite a large proportion of longer black hairs), the five longitudinal stripes white, very slightly tinged with buff, the lateral pair scarcely distinguishable on the pale flank. Face drab. Hands and feet buffy white like the dorsal stripes. Below white, the hairs white to their bases. Tail also pale buffy white, each hair with two black rings, the one near the base, the other subterminal broader.

Dimensions:—Head and body, 140; tail, 141; hindfoot, 35; ear, 17. Skull:—Greatest length, 38; basilar length, 28; zygomatic breadth, 21; interorbital breadth, 105; length of nasals, 10·5; diastema, 8; length of upper tooth row, 7.

Habitat.—Deesa, Palanpur.

Type.—Adult female. B. M. No. 13.9.18.105. Original number 3138, collected by Mr. C. A. Crump, on the 29th April, 1913. Presented to the National Collection by the Bombay Natural History Society.

The specimens from Deesa and several other places in the Palanpur State are all fairly typical, those however from Mt. Abu (4,300 feet) are darker and more richly coloured. This form ranges south as far as the northern part of Kathiawar, but thereafter the specimens grow darker in increasingly large numbers, and commence to show a passage to true *pennanti*.

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A LIST OF THE NATURAL ORDERS AND GENERA OF BOMBAY PLANTS WITH DERIVATIONS OF THE NAMES.

BY

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Assistant Professor of Botany, Agricultural College, Poona.

PART II.

(*Continued from page 290 of this Volume.*)

GENUS AND AUTHOR.	NATURAL ORDER.	DATE.	DERIVATION AND COMMON NAME.
Ebermaiera, Nees.	.. Acanth.	1832..	after Karl Heinrich EBERMAIER, a German writer on medicinal plants; 1767-1825.—N.
ECBOLIUM, Kurz.	.. Acanth.	1871..	from *ekbole*, a throwing out; causing abortion.
Echinocactus, Link and Otto.	.. Cact.	1827..	from *echinos*, a hedgehog, and *kaktos*, the name of a spiny plant.—N.
ECHINOPS, L.	.. Compo.	1737..	from *echinos* and *ops*; in reference to the spiny globular heads.—N. *Globe-thistle.*
Echinospermum, Sw.	.. Boragin.	1818..	the *nutlets* are provided with hooked *bristles.*
Echites, P. Br.	.. Apocyn.	1756..	from *echis*, a viper; alluding to the smooth twining shoots.—N.
ECLIPTA, L.	.. Compo.	1771..	from *ekleipo* to be deficient. *Cf. Perotis.*
EHRETIA, L.	.. Borag.	1759..	after G. D. EHRET, a German botanical draughtsman; 1708-1770.—N.
Eichhornia, Kth.	.. Ponte.	1843..	after J. A. F. EICHHORN, an eminent Prussian.—N. *Water-hyacinth.*
ELÆAGNUS, (Tourn.) L. †	.. Elæag.	1735..	from *elaia*, an olive, and *agnos*, the chaste tree, *Vitex Agnus-castus.*—N. *Oleaster or Silver-tree.*
Elæis, Jacq.	.. Palm.	1763..	from *elaia* an olive; oil is expressed from the nuts.—N. *Oil Palm.*
ELÆOCARPUS, Burm.	.. Til.	1747..	meaning the olive-fruit; the fruit is a drupe with a single bony tuburculate stone; used to make into rosaries worn by Brahmins and Fakirs (*E. Ganitrus*).—N.
ELÆODENDRON, Jacq. f. †	.. Celas.	1787..	meaning the olive tree; the seeds are oily.—N.
Elatine, L.	.. Elatin.	1737..	from *elati*, a fir tree, to which the leaves are compared.
ELATOSTEMA, Forst.	.. Urti.	1776..	

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Eleiotis, D.C.	.. Leg. P.	1825..	from *eleios*, a dodrmouse, and *ous*, *otos*, an ear; in reference to a supposed resemblance in the leaves.—Z.
Eleocharis, R. Br.	.. Cyper.	1810..	from *helos*, a marsh, and *chairo*, I delight; marsh plants.
Elephantopus, L.	.. Compo.	1737..	from *elephas* and *podus*; the elephant's foot; the leaves suggested the name.
Elettaria, Maton.	.. Scit.	1811..	from *elæchi*, its Indian name.—N. *Cardamoms.*
Eleusine, Gärtn.†	.. Gram.	1788..	from *Eleusis*, where was a temple of Ceres.—N.
Elionurus, H. & B.	.. Gram.	1805..	lower involucral glume usually furnished with fine filiform transparent oil-glands.
Ellertonia, Wight.	.. Apocyn.	1848..	in honour of J. Ellerton Stocks, a Bombay botanist.
Elytraria, Michx.	.. Acanth.	1803..	from *elytron*, a cover; the scapes are clothed will small rigid bracts.
Elytrophorus, P. B.	.. Gram.	1812..	from *elytron* and *phoreo*; palea very broad, truncately three-lobed.
Embelia, Burm. f.	.. Myrsin.	1768..	from its Cinghalese name.—N.
Emblica, Gärtn.	.. Euphor.	1791..	adapted from the vernacular name *amla*.
Emilia, Cass.	.. Compo.	1817..	of unknown origin.—C.
Endopogon, Nees.	.. Acanth.	1832..	from *endo* and *pogon*, a beard within; the corolla-throat is hairy.
Enicostemma, Bl.*	.. Gentian	1826..	
Enneapogon, Desv.	.. Gram.	1813..	the floral glumes are nine-cleft, hence the name.
Entada, Adans.	.. Leg. M.	1763..	a native name in Malabar.
Epaltes, Cass.	.. Compo.	1818..	from *epalthes*, healing; a medicinal name.
Ephedra, (Tourn.) L.	.. Gneta.	1737..	a Greek name for the Horse-tail; the plants are virgate.
Epicarpurus, Bl.	.. Urti.	1825..	the fruit is laxly clothed by the enlarged persistent perianth.
Epicharis, Bl.	.. Melia.	1825..	meaning beautiful; the flowers are referred to—Z.
Epidendrum, L.	.. Orchid.	1737..	meaning an epiphyte.—N.
Epipactis, Adans.	.. Orchid.	1763..	from *epipegnuo*, to coagulate.—N.
Episcia, Mart.	.. Gesner.	1829..	from *episkios*, shaded; shade loving plants.—N.
Epithema, Bl.	.. Gesner.	1826..	from a Greek word for a *lid*; the capsule is circumcis.
Eragrostis, Host.	.. Gram.	1809..	from *eros*, love, and *agrostis*, grass; in allusion to the loose dancing spikelets. *Lovegrass.*

* Durand gives *enicostema*.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Eranthemum, L.†	Acanth.	1747	from *ear*, spring, and *anthos* (Drury); from *eran* to love, and *anthemon*, a flower.—N.
Eria, Lindl.	Orchid.	1825	from *erion*, wool; in allusion to the pubescent flowers.
Erianthus, Michx.	Gram.	1803	from *erion* and *anthos*; there is a tuft of hair at the base of each spikelet, which makes the spikes look like tassels.
Erigeron, L.	Compo.	1737	from *er* spring, and *geron*, an old man; referring to the earliness of the plants.
Erinocarpus, Nimmo.	Til.	1839	from *erinaceus*, a hedgehog; the fruit is bristly.
Eriobatrya, Lindl.	Rosa.	1822	from *erion* and *botrys*; the fruits appear to be a *wooly bunch*.
Eriocaulon, L.	Eriocaul.	1742	from *erion* and *caulis*; the stem is terminated by the wooly head of flowers.
Eriochloa, H. B. K.	Gram.	1815	*erion*, wool, and *chloa*; the involucral glume is silky-hairy.
Eriodendron, DC.†	Malva.	1824	meaning the wool-tree; the tree yields kapok of commerce.
Erioglossum, Bl.	Sapin.	1829	*erion*, wool, and *glossa*, tongue.
Eriolæna, DC.	Stercul.	1823	from *erion* and *chlaina* (a cover); the calyx forms a wooly cover.
Eriophorum, L.	Cyper.	1735	from *erion* and *phoreo*; the heads are cottony.—*Cotton-grass.*
Erodium, L'Her	Geran.	1787	from *erodios*, a heron; the carpophore suggested the comparison.
Eruca, Tourn. †	Crucifer.	1763	Latin, of doubtful etymology.
Ervatamia, Stapf.†	Apocyn.		after Ervatamius.
Ervum (Tourn.) L.	Leg. P.	1737	the Latin name. *Lentil.*
Erycibe, Roxb.	Convol	1798	said to be after its native name.
Erysimum, (Tourn.) L.	Cruci	1735	from *eryo*, to draw; on account of its effects in drawing blisters.—N. *Hedge Mustard.*
Erythea, S. Wats	Palm.	1880	one of the Hesperides.—N. See *Ægle* above.
Erythracanthus, Nees	Acanth.	1832	the leaves are *red* beneath, and the bracts are *spiny*.
Erythraea, Renealm.	Gentian.	1796	from *erythros*, red; the flowers are such.
Erythrina, L.†	Leg. P.	1787	from *erythors*, red; the flowers are such. *Indian-coral-tree.*
Erythroxylum, P. Br.*	Lina.	1756	*erythrox*, red, *xylou*, wood.—*coca or Cocaine.*
Eschscholtzia, Cham.	Papaver.	1820	after J. F. Eschscholtz, a naturalist who accompanied Kotzebue round the world; 1793-1831.—N. *Californian-poppy.*

Erythroxylon L. 1759 is its synonym.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Ethulia, L. ..	.. Compo.	1763..	derivation obscure.
Eucalyptus, L'Her	.. Myrt.	1788..	from *eu*, well, and *kalypto*, covered. *Eucalyptus or Australian gum tree.*
Eucharidium, Fish. and Mey.	.. Onagr.	1835..	from *eucharis*, agreeable.—N.
Eucharis, Planch and Linden.	.. Amaryll.	1853.	from *eu* and *charis* (grace); the flowers are very graceful. *Amazon Lily.*
Euchlæna, Schrad	.. Gram.	1832..	from *eu* and *chlaina* (a mantla); the glumes are referred to. *Teosinte.*
Eugenia, (Michx.) L...	Myrt.	1735..	after Prince Eugene of Savoy, a promoter of botany.—N. *Malay-apple and Rose-apple.*
Eulophia, R. Br.†	.. Orchid.	1823..	from *eu* and *lophos* (a crest); the disk is usually ridged or crested.
Euonymus, L.	.. Celastr.	1737..	from *euonymos*, lucky.—N. *Spindle-tree.*
Eupatorium (Tourn.) L.	Compo.	1735..	named after Mithridatis. Eupator, King of Pontus.—N. *Trumpet-weed.*
Euphorbia. L.†	.. Euphor.	1737..	after Euphorbus, physician to Juba, King of Mauritania; so named by Dioscorides.—N. *Spurge*
Eurya,* Thunb.	.. Ternstrom.	1783..	from *eurys*, large; the flowers are referred to, but they are small. —N.
Euryale, Salisb.	.. Nymph.	1806..	Euryale is one of the Gorgons represented with fierce thorny locks; the leaves and calyx are thorny on the under surface. *Waterlily.*
Eurycles, Salisb.	.. Amaryll.	1812..	from *eurys*, broad, and *kleio*, to close up; the cup of the flower does not close up.--N.
Eutoca, R. Br.	.. Hydrophyll.	1823...	
Euxolus, Raf.	.. Amarant.	1836..	a name used by Theophrastus.—N.
Evodia, Forst	.. Ruta.	1776..	meaning pleasant odor.—B.
Evolvulus, L.	.. Convol.	1763..	from *evolvo*, to roll out; a non-twiner in an Order of twiners.
Exacum, L.†	.. Gentian.	1747..	from *ex*, out, *ago*, to drive; supposed to expel poison.
Excæcaria, L.†	.. Euphor.	1759..	from *excæcare*, to blind; alluding to the dangerous acrid juice of the plants.
Fagonia, (Tourn.) L..	Zygophyll.	1735..	from *phagein*, to eat.
Fagopyrum, Tourn	.. Polygon.	1742..	from *phagein*, to eat, and *pyros*, wheat; the grain is edible.—N. *Buckwheat.*
Fagræa, Thunb.	.. Logan.	1782..	after Jonas Theodore Fagræus, a physician and botanist; 1729-1797.—N.

* Doubtfully indigenous.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Falconeria, Royle	.. Euphor.	1839..	commemorative.
Farfugium, Lindl.	.. Compo.	1857..	
Farsetia, Turra	.. Cruci.	1765..	after Philip Farseti, a Venetian botanist.—N.
Fatsia, Dcne. & Pl.	.. Aral.	1854..	a Japanese plant-name.—N. *Chinese-rice-paper-plant.*
Feronia, Corr. †	.. Ruta.	1800..	Feronia was a Roman goddess of Forest.—*Elephant apple or Wood-apple.*
Ficus, (Tourn.) L.†	.. Urti.	1735..	the old Latin name. *Banyan, Fig. and Indian-rubber-tree.*
Filicium, Thw.	.. Sapind.	1865..	meaning fern-like; the leaves are referred to.
Fimbristylis, Vahl...	Cyper.	1806..	from *fimbrina*, a fringe, and *stylus*, a style; a character which belongs to the entire Order and also to the allied Order of Gramineæ.
Fittonia, E. Cœmans..	Acanth.	1865..	after E. & S. M. Fitton, two botanists.—N.
Flacourtia, Comm. ..	Bixa.	1785..	after Etienne de Flacourt, a director of the French East India Company; 1607-1661.—N.
Flagellaria, L.	.. Flagel.	1747..	from *flagellum*, a whip; they are climbers. *F. indica* has leaves with tedril-like tips, and slender stems.
Flaveria, Juss.	.. Compo.	1789..	from *flavus*, yellow; used in Chili to dye an yellow colour; the flowers are yellow.
Flemingia, Roxb.	.. Leg. P.	1812...	in honour of Dr. J. Fleming, Bengal Army, who died in 1815.—G.
Fleurya, Gaud.	.. Urti.	1826..	after J. F. Flewry, a writer on Orchids.
Floscopa, Lour.	.. Commel.	1790..	from *flos*, a flower, and *scopa*, a broom; referring to the aspect of the inflorescence.—Z.
Fluggea, Willd.	.. Euphor.	1805..	after John Flugge, a German cryptogamist.—N.
Fœniculum, (Tourn.) L.	Umbel.	1735..	the old Latin name.—N. *Fennel.*
Forskohlea, L.	.. Urti.	1767..	Commemorative.
Fragaria, (Tourn.) L...	Rosa	1735..	from Latin *fraga*, a strawberry.—N. *strawberry.*
Freesia, Klatt.	.. Irid.	1865..	derivation unknown.—N.
Frerea, Dalz.	.. Asclep.	1865..	in honour of Sir Bartle Frere, Governor of Bombay.
Fuchsia (Plum.) L.	.. Onagr.	1735..	after Leonard Fuchs, a German botanist; 1501-1566.—N.
Fuirena, Rottbl.	.. Cyper.	1773..	after J. Fuiren, a Danish botanist.

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Fumaria (Tourn.) L.	Fumaria.	1735	from *funus*, fume ; so named after the odour.
Furcrœa*, Vent.	Amaryll.	1793	after A. F. Fourcroy, a French chemist; 1755-1809.—N.
Gaillardia, Foug.	Compo.	1786	after M. Gaillard, a French patron of botany.—*Blanketflower.*
Gaillonia, A. Rich.	Rubia.	1834	Commemorative.
Galactia, P. Br.	Leg. P.	1756	from *galactos*, milk ; appln. ?
Galanthus, L.	Amaryll.	1735	from *galla*, milk, and *anthos*, a flower ; the flowers are milk-white.—N. *Snowdrop.*
Galedupa, Lamk.	Leg. P.	1786	Malabar name.
Galphimia, Cav.	Malpigh.	1799	anagram of Malpighia.
Garcinia, L. †	Gutti.	1737	after Lawrence Garcin, a French botanist and traveller.—N. *Kokam.*
Gardenia, Ellis †	Rubia.	1761	after Alexander Garden of Carolina.—N. *Dikamali.*
Garnotia, Brougn.	Gram.	1829	commemorative.
Garuga, Roxb.	Burser.	1814	its native name.—N.
Gasteria, Duval.	Lil.	1809	the flowers have a belly (gaster) at the base.—N.
Gaura, L.	Onagr.	1751	from *gauros*, superb.—N.
Gazania, Gartn.	Compo.	1791	after Theodore Gaza, 1393-1478, a learned Greek.—N.
Geissaspis, W. & A.	Leg. P.	1834	from *geisson*, a tile, and *ops*, appearance ; the overlapping bracts have that appearance.
Genianthus, H. f.	Asclep.	1883	*geneion*, the chin, *anthos*, flower.
Geniosporum, Wall.	Labiat.	1830	*geneion*, the chin, *sporum*, seed.
Geodorum, Jack.	Orchid.	1810	from *ge*, the earth, and *doron*, a gift.
Geophila, D. Don.	Rubia.	1825	from *ge*, and *philos* ; probably in allusion to the prostrate habit of the plants.
Geranium, (Tourn.) L.	Geran.	1735	from *gerenos*, a crane ; referring to the long carpophore.
Gerbera, Gronov.	Compo.	1737	from T. Gerber, a German naturalist of the eighteenth century.—C. *Barberton-daisy.*
Gesneria, L.	Gesner.	1737	after Conrad Gesner of Zurich, a botanist ; 1516—1565.—N.
Getonia, Roxb.	Combret.	1795	from its Indian name.—Z.
Gibsonia, Stocks	Polygon.	1848	after Nicholas A. Gibson, the joint author of The Bombay Flora by Dalzell and Gibson, 1861.
Gilia, Ruiz. & Pavon.	Polemon.	1794	after P. S. Gilio, a Spanish botanist.—N.
Girardinia, Gaud.	Urti.	1826	in honour of Girardin, a French botanist, joint author of a Manual of Botany in 1827.—C.
Gisekia, L.	Ficoid	1771	from Paul Dietrich Giseke, A German physician.

* Cooke gives *Furcræa.*

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GENUS AND AUTHOR.	NATURAL ORDER.	DATE.	DERIVATION AND COMMON NAME.
GIVOTIA, Griff.	.. Euphor.	1844..	
Gladiolus, (Tourn.) L.	.. Irid.	1735..	from *gladius*, a sword; the shape of the leaves is referred to—N. *Corn Flag.*
Gleditschia, (Clayton) L.	.. Leg.	1742..	after Gottlieb GLEDITSCH, Director of Botanic Gardens at Berlin.—N.
Glinus, Löfl	.. Ficoid.	1758..	the ancient name given by Theophrastus to the Maple. It is not obvious why this name was applied to this herb.—Z.
Gliricidia, H. B. K.	.. Leg.	1823.	
GLOBBA, L.	.. Scit.	1771..	its native name in the Moluccas.—N.
GLOCHIDION, Forst.	.. Euphor.	1776..	meaning barbed; it is not clear what is barbed.
GLORIOSA, L. †	.. Lil.	1735..	from *gloriosus*, full of glory; the plant *G. superba* fully merits both the generic and the specific names. *Tiger-lily or climbing-lily.*
GLOSSOCARDIA, Cass.	.. Compo.	1817..	the achenes are narrowly oblong, and much flattened.
GLOSSOGYNE, Cass.	.. Compo.	1827..	from *glossa* and *gyne*; in allusion to the styles being elongate like tongues.
GLOSSONEMA, Dcne.	.. Asclep.	1838..	*Glossa*, a tongue, and *nema*, a thread; the anthers are terminated by an inflexed membrane.
Glossospermum, Wall.	.. Stercul.	1831..	the seeds have a thin papery tongue-shaped wing in *G. velutinum*, Syn. *Melochia velutina.*
GLOSSOSTIGMA, W. & A.	Scroph.	1836..	the stigma is dialated, spathulate, recurved; hence the name.
Gloxinia, L'Her.	.. Gesner.	1785..	after Benj. Petr. GLOXIN of Colmar, a botanist.—N.
GLYCINE, W. & A. †	.. Leg. P.	1737..	from *glycys*, sweet; allusion? *Soy beans.*
GLYCOSMIS, Corr.	.. Ruta.	1805..	from *glukus*, sweet, and *osma*, smell.
*Glycicarpus**, Dalz.	.. Anacard.	1849..	meaning sweet fruits; they are edible in *G. racimosa* Syn. *Nothopegia Colebrookiana.*
GMELINA, L.†	.. Verben.	1742..	after S. Gottlieb GMELIN, a German naturalist, 1743-1774.—N.
GNAPHALIUM, L.	.. Compo.	1737..	from *gnaphalon*, soft down; the entire plant is hoary. *Note*: *Nephelium* is Litchi.
GNETUM, L.	.. Gneta.	1767..	from *gnemon*, its name in the Island of Ternate.
Gnidia, L.	.. Thymel.	1751..	from *Gnidus*, a town in Crete.
Godetia, Spach.	.. Onagr.	1835..	included under *Œnothera.*

* In Cooke it is *Glycycarpus*—a printer's mistake.

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Gomphandra, Wall...	Olaca.	1832..	from *gomphos*, a club, and *aner*, a man; the filaments are fleshy, flattened, with gland-tipped hairs at the top on the back, hollowed in front.
Gomphia, Schreb.	.. Ochna.	1789..	from *gomphos*, a club; alluding to the club-shaped nuts.
Gomphrena, L.	.. Amarant.	1737..	from *gomphos*, a club; the flowers are in heads elevated on long stocks. *Globe-amaranth.*
Goniocaulon, Cass.	.. Compo.	1817..	from *gonia*, an angle, and *kaulon*, a stem; the stem is angular or strongly ribbed.
Goniothalamus, H. f. & Thom.	.. Anona.	1855..	the thalamus is angular.
Goodyera, R. Br.	.. Orchid.	1813..	after John Goodyer, a British botanist.—N. *Adder's-violet.*
Gordonia, Ellis.	.. Ternstr.	1770..	after Alexander Gordon, a nurseryman.—N.
Gossypium, L. †	.. Malva.	1735..	its Latin name, used by Pliny.—N. *Cotton.*
Gouania, Jacq.	.. Rhamn.	1769..	after Anthony Gouan, a professor at Montpelier, 1733—1821.—N.
Gracilea, Kœn.	.. Gram.	1803..	*gracilis*, slender?
Grangea, Adans.	.. Compo.	1763..	after Grange.
Graptophyllum, Nees...	Acanth.	1832..	from *grapho*, to write, and *phyllon*, a leaf; the leaves are mottled. *Caricature-plant.*
Gratiola, (Rupp.) L.	.. Scroph.	1737..	Diminutive from *gratea*, grace.
Grevillea, R. Br.	.. Protea.	1810..	after C. F. Greville, a patron of botany.—N. *Silver-oak.*
Grewia, L. †	.. Tilia.	1735..	after Nehemiah Grew, a botanist.—N. *Phalsa.*
Griffithella, Warming.	Podostemon.	..	after W. Griffith.
Griffithia, W. and A...	Rubia.	1834..	Do. do.
Grislea, L.	.. Lythr.	1737..	after Gabriel Grisley, a botanist of the seventeenth century.—N.
Grona, Lour.	.. Leg. P.	1790..	from *grona*, a groove; allusion?
Grumilea, Gärtn.	.. Rubia.	1788..	from *grumulus*, diminutive of *grumus*, a heap, a lump; in allusion to the nature of the albumen in the seeds.—Z.
Guaiacum, (Plum.) L.	.. Zygopyll	1737..	from its South American name.—N. *Lignum-vitæ.*
Guarea, (Allem.) L.	.. Melia	1771..	from its name in Cuba.—N.
Guatteria, R. & P.	.. Anona	1794..	after John B. Guatteri, an Italian botanist.—N. *Lance-wood.*
Guazuma, Plum.	.. Stercul.	1763..	a Mexican name.—N.
Guilandina, L.	.. Leg. C.	1737..	commemorative.
Guizotia, Cass.	.. Compo.	1827..	after M. Guizot, the celebrated French statesman.—N. *Niger-seed.*

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Gymnema, R. Br.†	.. Asclep.	1809..	from *gymnos*, naked, and *nema*, a thread; probably in allusion to the exerted apex of the style.
Gymnosporia, W. & A.	Celastr.	..	the arillate seeds are very conspicuous when the capsules have burst open.
Gymnostachyum, Nees.	.. Acanth.	1832..	from *gymnos* and *stachys*; the bracts and bracteoles of the spike are very minute.
Gynandropsis, DC.†...	Cappar.	1824..	the flowers appear with a gynandrophore—a column bearing pistil and stamens.
Gynerium, H. & B.	.. Gram.	1809..	from *gyne* and *erion* (wool); the stigmas are woolly.—N. *Pampas-grass.*
Gynocardia, R. Br.	.. Bixa.	1819..	*gyne*, female, *kardia* heart.
Gynura, Cass.†	.. Compo.	1825..	from *gyne* and *oura* (a tail); alluding to the tail-like appendage of the style.
Gypsophila, L.	.. Caryo.	1751..	from *gypsos* and *philein*; prefering lime-stone soil.—*Baby's-breath.*
Gyrocarpus, Jacq.	.. Combret.	1763..	from *gyros*, a circle, and *karpos*, a fruit; the fruit is crowned with long wing-like calyx-segments (of which there are two in *G. americanus*); the fruit performs gyrations in falling?
Habenaria, Willd.†..	Orchid.	1805..	from *habina*, a rein; the spur is long like a rein.—N.
Hæmanthus, (Tourn.) L.	.. Amaryll.	1735..	the spathe and filaments are red —*African-tulip or blood-flower.*
Hæmatoxylon, L.	.. Leg. M.	1735..	from *haimatos* and *xylon*, meaning red wood; the wood yields the dye known by the same name. *Campeachy-wood or logwood.*
Halocharis, Moq.	.. Cheno.	1849..	from *halo*, sea-salt, and *charis*, grace; a halophyte.
Halopyrum, Stapf.	.. Gram ..	..	from *halo* and *pyros* (a grain); the grass is halophilous.
Haloragis, Forst.	.. Halorag.	1776..	*halo*, salt, *rax*, grape.
Haloxylon, Bge.	.. Cheno.	1851..	shrubs or trees containing a lot of salts.
Hamelia, Jacq.	.. Rubia	1760..	after Henry Louis de Hamel du Monceau, a French author; 1700-1782.—N.
Hamiltonia, Roxb.†..	Rubia	1814..	after William Hamilton, an American botanist.—N.
Haplanthus, Nees	..Acanth.	1832..	from *haplos*, single, and *anthos*, a flower; application?
Haplophyllum, Rchb...	Ruta.	1832..	the leaves are simple.
Hardwickia, Roxb.	..Leg. C.	1814..	after General Hardwicke, once of the East India Company.—N.
Harpullia, Roxb.	..Sapind.	1814..	a name of Indian origin.—Z.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Haworthia, Duval.	.. Lil.	1809..	after A. H. Haworth, a botanist; died 1833.—N.
Hebradendron, R. Grah.	Gutti.	1836..	meaning inscribed trees; application? The testa is, however, muriculate, and the sessile stigma is tubercled.
Hedera, (Tourn.) L.	.. Aralia.	1737..	its old Latin name.—N. *Ivy*.
Hedychium, Kön.†	.. Scit.	1783..	from *hedys*, sweet, and *chion*, snow; the flowers are white and sweetly fragrant. *Indian-garland-flower*.
Hedyotis, L.	.. Rubia.	1747..	from *hedys*, sweet, and *otos*, an ear; application?
Hedysarium, (Tourn.) L.	Leg. P.	1735..	an ancient name used by Dioscorides.—N.
Helenium, L.	.. Compo.	1753..	from *Helenion*, a Greek name probably after Helen of Troy.—N.
Heleocharis, Lestib.	.. Cyper.	1819..	from *helos* and *charis*; a helophyte or a marsh plant.
Heleochioa, Houst.	.. Gram.	1801..	from *helios* and *chloa* (grass); a habitat name, not quite apt.
Helianthus, L.	.. Compo.	1735..	from *helios* and *anthos*; the sunflower.—N.
Helichrysum, (Vaill.) L.	.. Compo.	1737..	from *helios* and *chrysos*—the golden sun-like flowers.—N.
Heliconia, L.	.. Scitam.	1767..	from Helicon, a mountain in Greece, consecrated to the Muses.—N.
Helicteres, (Pluk.) L.	Stercul.	1735..	from *helix*, a spiral; the twisted capsule is referred to.—*Screw-tree*.
Heligme, Bl.	.. Apocyn.	1828..	from *helix*, a spiral; the filaments are twisted together.
Heliotropium, (Tourn.) L. †	Borag.	1735..	from *helios*, the sun, and *trope*, a turning; the flowers are turned outwards and upwards. *Heliotrope*.
Helipterum, DC.	.. Compo.	1837..	from *helios* and *pteron*; referring to the plumed pappus.
Helmia, Kth.	.. Dioscor.	1850..	after C. Helm, a German ecclesiast.—N.
Helosciadum, Koch.	.. Umbel.	1824..	*helos*, a swamp, *skiadion*, a shade.
Hemerocallis, L.	.. Lil.	1735..	from *hemero*, a day, and *kallos*, beauty.—N. *Day Lily*.
Hemiadelphis, Nees	.. Acanth.	1832..	from *hemi*, half, and *adelphia*, a fraternity; there are two stamens instead of four; but quite a number of other genera of the same order have this reduced number.
Hemichoriste, Nees	.. Acanht.	1832..	from *hemi* and *choristos*—half separated; allusion from hemigraphos, half written, in allusion to the shape of the corolla.

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Hemicyclia, W. & A.	Euphor.	1833..	the stigma is semiorbicular.
Hemidesmus, R. Br...	Asclep.	1809..	from *hemi* and *desmos* (a tie); the filaments are subconnate at the base. *Indian-sarsaparilla.*
Hemigraphis, Nees ..	Acanth.	1847..	meaning half written over; in allusion to the corolla.
Hemigyrosa, Bl. ..	Sapind.	1850..	there is an unilateral pulvinate disk; but the name may have nothing to do with it.
Heptage ..	Malpigh.	..	from *hiptamai*, to fly; it has 3-winged samaras.
Heptapleurum, Gärtn.	Aralia.	1791..	from *hepta*, seven, and *pleuron*, a rib; in allusion to the ribbed fruit.—N.; the fruit is, however, five to six angled.
Heracleum, L. ..	Umbel.	1735..	after Heracles or Hercules.—N.
Heritiera, Dryand ..	Stercul.	1789..	after Charles Louis L'heritier, a French botanist; 1746-1800.—N. *Looking-glass-tree.**
Herpestes, Kth. ..	Scroph.	1823..	from *herpestes*, anything that creeps: the plants have a creeping habit.
Herpestis, Gärtn. ..	Scroph.	1805..	do. do.
Heterocarpus, Wight...	Commel.	1853..	the lateral valves of the fruit are linear and empty, the dorsal ellipsoid, subrugose.
Heterophragma, DC ..	Bignon.	1845..	from *heteros*, different and *phragma*, a division.
Heterostemma, W. & A. ..	Asclep.	1834..	relates to the *corona* which consists of five large fleshy lobes spreading horizontally from the staminal-column, usually with a large erect appendage on the upper side.
Heuchera, L. ..	Saxi.	1735..	after Johann Heinrich Heucher, 1677-1747, of Wittenburg.—N.
Hevea, Aubl. ..	Euphor.	1775..	from its local name in South America.—N. *Para Rubber Tree.*
Hewittia, W. & A. ..	Convol.	1837..	commemorative.
Hexacentris, Nees ..	Acanth.	1832..	from *hex*, six, and *kentron*, a spur; the upper two anthers have each one spur, and the lower two anthers have each two spurs; Syn. *Thunbergia mysorensis*. Cf. *Dicentra* above.
Heylandia, DC. ..	Leg. P.	1825..	commemorative.
Heynea, Roxb. ..	Melia.	1814..	do.
Hibiscus, L.† ..	Malva.	1737..	a name used by Dioscorides.—N. *Okra or Lady's-finger.*

* The leaves appear silvered on the lower surface.

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Hippion, F. W. Schmidt.	Gentian.	1793..	from *hippos*, a horse ?
Hippocratea, L.	.. Celastr.	1737..	after Hippocrates, a Greek physician.—N.
Hippomane, L.	.. Euphor.	1737..	meaning mad after horses ; referring to its effects on mares.—N.
Hiptage, Gärtn.†	.. Malpigh.	1791..	from *hiptami*, to fly ; the fruits are winged.
Hiræa, Jacq.	.. Malpigh.	1760..	after De La Hire, a French botanist.
Hitchenia, Wall.†	.. Scitamin.	1834..	commemorative.
Hochstetteria, DC.	.. Compo.	1838..	do.
Hoffmannia, Sw.	.. Rubia.	1788..	after G. F. Hoffmann, professor of botany at Gottingen ; 1761-1826.—N.
Holarrhena, R. Br.	.. Apocyn.	1809..	from *holos*, entire, and *arren*, male ; the anthers are free from the stigma.—C.
Holcus, L.	.. Gram.	1735..	the old Greek name of a grass.—N.
Holigarna, Buchham.	Anacard.	1814..	from *Hulgeri*, its local name in the Deccan.—Z.
Holmskioldia, Retz.	.. Verben.	1791..	after Theodore Holmskiold, a Danish botanist, 1732-1794.—N.
Holoptelea, Planch†	.. Urti.	1848..	having entire petals ; there are no petals, and the calyx is partite in the Bombay species.
Holostemma, R. Br. †	Asclep.	1809..	from *holos* and *stemma*, a perfect crown ; corona *annular*, fleshy, truncate.
Homalium, Jacq.	.. Samyd.	1760..	from *homalos*, smooth ?
Homalomena, Schott.	Araceæ	1832..	from *homalos* flat, and *nema*, a thread ; the filaments are flat.—N.
Homonoia, Lour.	.. Euphor.	1790..	from *homonoia*, uniformity ; in reference to the uniformly branched filaments.—Z.
Hopea, Roxb.	.. Diptero.	1814..	commemorative.
Hopea, L.	.. Styra.	1767..	do.
Hoppea, Willd.	.. Gentian	1801..	
Hordeum, (Tourn.) L.	Gram.	1735..	the ancient Latin name.—N. *Barley.*
Howea, Becc.	.. Palm.	1877..	after Lord Howe's Island, its habitat. Lord Howe lived from 1725 to 1799. *Thatch Balm.*
Hoya, R. Br. †	.. Asclep.	1809..	after Thomas Hoy, an English gardener.—N. *Waxflower.*
Hugonia, L.	.. Lin.	1737..	commemorative.
Humulus, L.	.. Urti.	1735..	from *humus*, the ground ; meaning prostrate.—N.
Hunnemannia, Sweet.	Papaver	1828..	after J. Hunnemann, a botanist ; died 1837.—N.
Hura, L.	.. Eupho.	1737..	its American name.—N. *Sandbox-tree.*

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Hyacinthus, (Tourn.) L.	Lil	1735..	the ancient Greek name used by Homer for the Iris.—N. *Hyacinth.*
Hydnocarpus, Gärtn.	Bixa.	1788..	from *hydnos*, a tuber, and *karpos*, a fruit; the fruits are rough and hard.
Hydrangea,(Gronov.)	L. Saxifrag.	1737..	from *hydor*, water, and *aggeion*, a vessel; the fruits are shaped like a goblet.—N.
Hydriastele, Wendl. & Dr.	.. Palm.	1875..	from *hydria*, a fountain, and *stele*, a column; the tall stems grow near springs.—N.
Hydrilla, L. G. Rich..	Hydrocharit..	1811	from *hydor*, water; an aquatic.
Hydrobryum, Endl. ..	Podostemon.	1841	from *hydor* and *bryo*; meaning growing near water.
Hydrocotyle, (Tourn.) L.	Umbel.	1735	from *hydor*, water, *kotyle*, a flat cup; in allusion to the cup-shaped leaves of *H. vulgaris*, sometimes containing water.—C.
Hydrolea, L...	.. Hydrophyll.	1763	from *hydor*, water, *elaia*, oil.
Hydrophylax, L. f...	Rubia.	1781	a creeping herb growing along the coast.
Hydrotrophus, C. B. C.	Hydrochar.	1873..	submerged tufted scapigerous herbs.
Hygrophila, R. Br...	Acanth.	1810..	from *hygros*, moist, and *phileo*, to love; named after the habitat.
Hygroryza,* Nees. ..	Gram.	1833..	a floating grass with feathery whorled roots at the nodes, hence the name.
Hymenantherum, Cass.	Compo.	1817..	from *hymen*, a membrane, and *antheros*.
Hymenodictyon, Wall.	Rubia.	1824..	from *hymen*, a membrane, and *dictyon*, a net; the seeds are girded by a reticulated membrane.—N.
Hyophorbe, Gärtn.	.. Palm.	1791..	from *hys* and *phorbe*, hog's food; in allusion to the fruits being eaten by pigs.
Hyoscyamus, (Tourn.) L.	Solan.	1735..	*hyos kyanios*, Hog's bean; the ancient Greek name *Henbane*.
Hypericum, (Tourn.) L.	Elat.	1737..	a name used by Dioscorides.—N. *Rose of Sharon.*
Hyphœne, Gärtn.	.. Palm.	1788..	from *hyphaino*, to entwine; alluding to fibres of the fruit.—N. *Doum Palm.*
Hypoestes, Soland ex R. Br.	.. Acanth.	1810..	a Greek term signifying an under garment referring to the (lanate) bracts which are often connate.
Hypolytrum, Rich.	.. Cyper	1805..	from *hypo elytron*; in reference to the two or three small scales included within the larger one —N.

* Hygrorhiza, Nees in Cooke.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Hypoxis, L.	.. Amaryll.	1759..	from *hypo oxys*; the base of the capsule is sharp.—N.
Hyptis, Jacq.	.. Lab.	1786..	meaning clawed?
Iberis, (Dill.) L.	.. Cruci.	1735..	a geographical name (Spain)—Iberia. *Candytuft.*
Ichnocarpus, R. Br...	Apocyn.	1809..	from *ichnos*, a vestige, and *karpos*, a fruit; the follicles are long and slender.
Ilex, (Tourn.) L.	.. Ili.	1735..	from Celtic *oc* or *ac*, a term having allusion to the spinulose leaves (Drury); a Latin name.—N. *Holly.*
Ilysanthes, Raf.	.. Scroph.	1820..	*ilys*, mud, *anthos*, flower.
Impatiens, (Riv.) L.†..	Gera.	1735..	in allusion to the fruits bursting on the least touch. *Balsam.*
Imperata, Cyr.	.. Gram.	1792..	after F. Imperati, a Neopolitan botanist.
Incarvillea, Juss.	.. Bignon.	1789..	after P. Incarville, a Chinese Jesuit, and a botanist, 1743.—N.
Indigofera, L.	.. Leg. P.	1737..	from *indigo*, and *fero*.—*Indigo-plant.*
Inga, Scop.	.. Leg. M. ..	..	A south American name.—N.
Inula, L. ..	.. Compo.	1747..	said to be another form of Helenion.—N.
Ionidium, Vent.	.. Viola.	1803..	from *ion*, violet, and *eidos*, appearance.
Iphigenia, Kth.	.. Lil.	1843..	named after Iphigenia, daughter of Agamemnon.—N.
Ipomœa,* L.†	.. Convol.	1735..	from *ips*, bindweed, and *omoios*, similar.—N. *Moon-flower, Morning Glory, etc.*
Iresine, P. Br.	.. Amaran.	1756..	*erios*, wool; the plant is woolly.
Iris. (Tourn.) L.	.. Irid.	1735..	the Greek name for the rainbow, used as a name of this plant since the time of Hippocrates.—N.
Isachne, R. Br.	.. Gram.	1810..	from *isos*, equal, and *achne*, a glume; referring to the equal glumes.—C. and Z.
Isatis, (Tourn.) L.	.. Cruci.	1735..	its old Greek name.—N.
Ischæmum, L.	.. Gram.	1742..	*ischaimos*, staunching blood.
Iseilema, Anders.	.. Gram.	1856..	
Isolepis, R. Br.	.. Cyper.	1810..	from *isos*, and *lepis*, scales equal; alln.?
Isonandra, ‡ Wight.	.. Sapot.	1840..	from *isos*, equal, and *andros*, male; there are eight stamens, and eight sepals and petals taken together.
Isotoma, Lindl.	.. Campan.	1826..	the corolla is *equally cut.*
Ixora, L.† ..	.. Rubia.	1735..	Cf. Sanskrit Ishvara, God.—*Flame-of-the-woods.*

* *Ipomaea* in Durand.
‡ Doubtfully indigenous.

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GENUS AND AUTHOR.	NATURAL ORDER.	DATE.	DERIVATION AND COMMON NAME.
Jacaranda, Juss.	Bignon.	1789	its name in Brazil.
Jacobinia, Moric.	Acanth.	1846	derivation doubtful.—N.
JACQUEMONTIA, Choisy.†	Convol.	1833	after JACQUEMONT, who worked at Indian Botany.
Jacquinia, L.	Myrsin.	1759	after Nicholas Joseph JACQUIN, 1727—1817, Professor of Botany at Leyden.—N.
Jambosa, DC.	Myrt.	1828	a Brazilian word?
JASMINUM, (Tourn.) L.†	Olea.	1735	according to Linnæus from *ion*, a violet, and *osme*, smell; another derivation is from the Arabic name *Ysmyn*. *Jasmine.*
JATROPHA, L.†	Euphor.	1735	from *iatros*, physician, and *trophe*, food.—N.
Johnia,* W. & A.	Leg. P.	1834	commemorative?
Jonesia, Roxb.	Leg. C.	1795	commemorative?
JOSEPHIA, Wight	Orchid.	1851	after Dr. JOSEPH DALTON HOOKER, the botanist.
Juncellus, Gris	Cyper.	1817-1911.	diminutive of *Juncus*.
JUNCUS, (Tourn.) L.	Junc.	1735	from *jungo*, to join; ropes were made from it.—N. *Sedges and Rushes.*
Juniperus (Tourn.) L.	Conifer.	1735	an old Latin name.
JUSSIEUA, L.‡	Onagr.	1737	after the family of JUSSIEU.—N.
JUSTICIA, (Houst.) L.†	Acanth.	1737	in honour of J. JUSTICE, a Scotch horticulturist.—N.
KÆMPFERIA, L.†	Scitam.	1737	after E. KÆMPFER, 1651-1716, a German botanist.—N.
KALANCHOE, Adans.†	Crassul.	1763	its Chinese name.—N.
KANDELIA, W. & A.	Rhizo.	1834	from its Malabar name.—Z.
Kanilia, Bl.	Rhizo.	1849	
Karatas, (Plum.) Mill.	Bromel.	1752	derivation uncertain.—N.
KEDROSTIS, Medic.	Cucur.	1791	derivation uncertain.
Kennedya, Vent.	Leg. P.	1804	named after an English nurseryman.—N.
Kigelia, DC.	Bignon.	1845	from *Kigeli-keia*, its native name on the Mozambique Coast.—Z. *Sausage-tree.*
KLEINHOVIA, L.†	Sterculi.	1763	after KLEINHOFF, a botanist of Batavia.—N.
KLUGIA, Schlecht.	Gesner.	1833	named after W. KLUG, M.D.—N.
KNOXIA, L.	Rubia.	1747	after R. KNOX, a traveller and resident in Ceylon.—N.
KOCHIA, Roth.†	Cheno.	1801	in honour of Herr KOCH, a German botanist.
Kopsia, Bl.	Apocyn.	1823	after Jean KOPS, 1765-1849, a German professor.—N.
KYDIA, Roxb.†	Malva.	1814	after Colonel Robert KYD, who died in 1794; first Director of the Calcutta Botanic Gardens.—N.

* Doubtfully indigenous.
‡ Jussiæa in Cooke.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Kyllinga, Rottb.	.. Cyper.	1773	.. after Peter Kylling, 1640-1696, a Danish botanist.—N.
Lablab, Adans.	.. Leg. P.	1763	.. the Arabic name of *Convolvulus*.—N.
Lactuca, (Tourn.) L.†	Compo.	1735	.. in allusion to the *lac*, or latex of the plants.—N. *Lettuce*.
Lafœnsia, Vand	.. Lythr.	1788	.. after the Duke of Lafoens, 1719-1806.—N.
Lagarosiphon, Harv.	Hydrochar.	1842	.. the ovary is produced into a filiform beak.
Lagasœa,* Cav.	.. Compo.	1803	.. after M. Lagasca, a Spanish botanist, died 1849.—N.
Lagenandra, Dalz. †	Araceæ.	1852	.. meaning anthers bottle-shaped; the anthers are sessile, truncate, with conic perforate tips.
Lagenandrea, Dalz.	.. Convol.	..	
Lagenaria, Ser.	.. Cucur.	1825	.. *lagena*, a flask; in allusion to the shape of the fruit.—N. *Bottle Gourd*.
Lagerstrœmia, L. †	.. Lythr.	1759	.. after Magnus Lagerstrom of Gottenberg, 1696-1759.—N. *Pride of India*.
Laggera, Sch. Bip.	.. Compo.	1841	.. in honour of Dr. Lagger, a Swiss botanist of the nineteenth century.—C.
Lagunæa, Schreb.	.. Malva.	1791	.. in honour of Andres da Laguna, a Spanish botanist.
Lagurus, L.	.. Gram.	1737	.. *lagos*, and *oura*, hare's tail.—N. such is the inflorescence.
Lamprachæeni u m, Benth. ‡	Compo.	1873	.. *lampros*, brilliant, and *achene*: the achenes are glabrous and shining.
Lansium, Rumph.	.. Melia.	1741	.. *lanseh*, a vernacular name.
Lantana, L. †	.. Verben.	1737	.. an ancient name of Viburnum (Drury); an old Italian name for the Wayfaring tree.—N.
Laportea, Gaud.	.. Urti.	1826	.. after M. Laporte.
Lappago, Schreb.	.. Gram.	1789	.. from *lappa*, burdock; the upper involucral glumes are hispid, or spinous-hooked.
Lasianthus, Jack.	.. Rubia.	1823	.. *lasios*, wooly, and *anthos*, flower; the corolla throat is villous.
Lasiopogon, Cass.	.. Compo.	1818	.. from *lasios*, woolly, and *pogon*, a beard, the outer involucral bracts are woolly on the outside.
Lasiosiphon, Fresen.	.. Thym.	1838	.. the perianth tube is silky.
Latania, Comm.	.. Palm.	1789	.. after its native name in Mauritius—N. *Latanier Palm*.
Lathyrus (Tourn.) L. †	Leg. P.	1735	.. a name used by Theoprastus for the pea.—N.

* *Lagasca*, Cav. in Cooke.

‡ *Lamprachenium* in Cooke.

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LATIPES, Kth.	.. Gram.	1830..	*latus*, broad, *pes* foot.
LAUNÆA, Cass.	.. Compo.	1822..	in honour of M. de LAUNAY, a French botanical author of the eighteenth century.—C.
Laurus, (Tourn.) L.	.. Laur.	1737..	the old Latin name—N. *Laurel.*
LAVANDULA, (Tourn.) L.†	Labiat.	1740 .	from *lavo*, to wash ; in allusion to the use made of its distilled water *Lavender.*
Lavatera, L. ..	.. Malva.	1737..	after two brothers LAVATER physicians of Zurich, who lived in the eighteenth century. —N.
LAWIA, Griff. ..	.. Podostem.	1849..	after LAW, a botanist of India.
Lawsonia, L. ..	.. Lythr.	1737..	after Dr. Isac LAWSON (1709), a botanical traveller.—N. *Henna-plant.*
Lebretonia, Schranck..	Malva.	1819..	commemorative.
LECANTHUS, Wedd.	.. Urti.	1854..	from *lecythos*, an oil-jar ; the seed vessels are such.—N.
Ledebouria, Roth.	.. Lil.	1821..	after M. LEDEBOUR, a botanist.
LEEA, (Royen) L.	.. Ampel.	1767..	after James LEE, 1715-1795, a nurseryman.—N.
LEERSIA, (sol.) Sw.	.. Gram.	1788..	after Joh. Dan. LEERS, 1727-1774, a German apothecary and botanist.—Z.
Legendrea. .. Webb. and Berth.	.. Convol.	1836-50..	commemorative.
LEMNA, L. ..	.. Lemna.	1735..	from *lepis*, a scale, the sessile leaves look so (Drury) ; an old Greek name.—N. *Duckweed.*
Lens, (Tourn.) L.	.. Leg. P.	1755..	the classical name.—N. *Lentil.*
LEONOTIS, R. Br.	.. Labiat.	1811..	from *leon*, a lion, and *otes*, an ear ; from a fancied resemblance in the corolla.
Leontodon, L.	.. Compo.	1737..	from *leontos*, a lion, and *odontos*, a tooth.
LEONURUS, L.	.. Labiat.	1735..	from *leon*, and *oura*, a tail.
LEPIDAGATHIS, Willd...	Acanth.	1800..	from *lepis*, a scale, and *agathis*, a ball ; the inflorescence and fruit form a scaly ball.
Lepidium, L.	.. Cruci.	1735..	from *lepis*, probably refers to the form of the pods. *Garden Cress.*
Leptacanthus, Nees	.. Acanth.	1832..	from *leptos*, slender, and *acanthus* ; the whole plant is slender.
LEPTADENIA, R. Br.	.. Asclep.	1809..	from *leptos*, slender, and *aden*, a gland ; in reference to the slender pollen masses.
LEPTOCHLOA,* P. B.	.. Gram.	1812..	from *leptos*, and *chloa*, meaning a slender grass ; some are slender.
Leptosiphon, Benth.	.. Polemon.	1833..	synonym *Gilia.*

* Not mentioned by Cooke ; discovered by Mr. R. K. Bhide after Cooke's publication.

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Leptosyne, DC.	.. Compo.	1836..	synonym *Coreopsis*.
Lepuranda, Nimmo	.. Urti.	1839..	*lepuros*, in a husk, *aner*, a male.
LETTSOMIA, Roxb.†	.. Convol.	1814..	after J. C. LETTSOM, a British physician and naturalist.
LEUCÆNA, Benth.	.. Leg. M.	1842..	probably from *leukos*, white; referring to flowers.—B.
Leucanthemum, (Tourn.) L.	Compo.	1735..	*leucos*, white, *anthos*, flower.
LEUCAS, (Burm.) R. Br.	Labiat.	1737..	from *leucos*, white; the corolla is snow white.
Leucoblepharis, Arn.	.. Compo.	1838..	Syn. *Blepharispermum*, *q. v.*
Leucodictyon, Dalz.	.. Leg. P.	1850..	white net; in allusion to the whitish veins on the leaflets?
Lichenora, Wight.	.. Orchid	1852..	Syn. *Porpax*; the latter has much depressed subdiscoid pseudobulbs clothed with reticulate sheaths.
Licuala, Thunb.	.. Palm.	1782..	its name in the Macassar language. *Pinang-lawyers*.
Ligularia, Cass.	.. Compo.	1816..	*ligula*, a strap, referring to the florets.—N.
LIGUSTRUM, (Tourn.) L.†	Olea.	1735..	from *ligare*, to tie; the branches are flexible enough to form a tie.
Lilium, (Tourn.) L.	.. Lil.	1737..	from Celtic *li*, whiteness; the flowers are white (Drury); the old Latin name.—N.
LIMEUM, L.	.. Ficoid.	1759..	from *lomios*, a pest; on account of the poisonous properties of the plant. According to Pliny (XXVI. 76) a plant of that name was used in Gaul for poisoning arrows.—Z.
LIMNANTHEMUM, Gmel. †	Gentian.	1770..	from *limne*, a marsh, and *anthamon*, flowering; marsh flowers (the flowers are showy). *Waterlily or Water-snowflake*.
LIMNOPHILA, R. Br...	Scroph.	1810..	from *limne*, a marsh, and *phileo*, to love; named after the habitat.
LIMNOPHYTON, Miq...	Alisma.	1855..	*limen*, a marsh, *phyton*, a plant.
Limodorum, (Tourn.) L.	Orchid.	1740..	*limon*, and *doron*; the meadow's gift.
LIMONIA, L.	.. Ruta.	1763..	from the Persian name of the Citron.—C.
LINARIA, (Tourn.) Mill *	Scroph.	1752..	after the genus Linum, on account of the similarity in leaves. *Toadflax*.
LINDENBERGIA, Lehm. †	Scroph.	1828..	after J. B. LINDENBERG, a German botanist of the nineteenth century.
LINOCIERA, SW.	.. Olea.	1791..	after a French physician, G. LINOCER.

* Linaria, Juss. in Cooke.

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LINUM, (Tourn.) L. †	Lina.	1735	from Celtic *llin*, thread (Drury): from *Linon*, the old Greek name used by Theophrastus.—N. *Flax or linseed Plant.*
LIPARIS, L. C. Rich †	Orchid.	1818	*liparos*, smooth (leaves)—N.
LIPPIA, (Houst) L.	Verben	1773	after Augustus LIPPI, a French traveller in Abyssinia—N.
LITSEA, Lam.	Lauri	1789	from the Japanese name—N.
Livistona, R. Br.	Palm.	1810	in honour of P. MURRAY, Baron of Livistone, the founder of the Botanic Garden of Edinburgh.* *Chinese Livistona.*
LOBELIA, (Plum.) L.†	Campanul.	1737	after Matthias de L'OBEL, 1538-1616, a botanist to James I—N.
LOCHNERA, Rchb.	Apocyn.	1828	after M. Fr. LOCHNER, 1662-1730, a German botanist—Z.
Lodoicea, Comm. ‡	Palm.	1805	said to be altered from LAODICEA, so called after LAODICE, daughter of Priam—*Coco de mer, or Double Coconut.*
Lonchocarpus, H.B.K.	Leg. P.	1823	lance-fruit, from *logche, lonche*, and *karpos*, referring to the form of the pods.—Z.
Lonicera, L.	Caprifol.	1737	after Adam LONICER, 1528-1586, a German botanist—N. *Honeysuckle.*
LOPHOPETALUM, Wight.	Celas.	1839	from *lophos*, and *petal*, crested petals; the petals are cristate or lamellate on the inner face.
LOPHOPOGON, Hack	Gram.		meaning crested beard; the upper involucral glume is *hirsute* near the apex and *aristate.*
Lophospermum, D.Don.	Scroph.	1827	*lophos*, a crest, and *spermum*, seed.
LORANTHUS, L.	Loranth.	1740	from *loron*, a thong, and *anthos*, a flower; the lobes of the corolla look like a thong.
LOTONONIS, Eckl. and Zeyh.§	Leg. P.	1836	from the two generic names *Lotus* and *Ononis*—Z. Cf. for a similarly formed name *Zamioculas* below.
LOTUS (Tourn.) L.	Leg. P.	1735	the name *Lotus* was given by Dioscorides to some leguminous plants—N.
LUDWIGIA, L.	Onagr.	1737	after Christian Gottleib LUDWIG, 1709-1773, botanist & traveller, and professor at Leipzig, author of several botanical works—Z.
LUFFA, (Tourn.) L.†	Cucurbit.	1735	from Arabic *louff*.—N. *Vegetable Sponge.*

* See the journal of the Bombay Natural History Society, Vol. XXI, p. 343.

‡ Durand and Engler-Prantl give Labill as the author of this genus.

§ Engler-Prantl give DC. as the author.

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Luisia, Gaud. †	Orchid.	1826	said to be called after Don Luis de Torres, Spanish botanist.—N.
Lumnitzera, Willd.	Combret.	1803	after the Hungarian physician and botanist Steph. Lumnitzer. 1750-1806.—Z.
Luvunga, Ham.	Ruta.	1831	from *Luvunga-luto*, its Sanskrit name.—Z.
Lychnis, (Tourn.) L.	Caryophyll.	1735	from *lychnos*, a lamp; referring perhaps to the brilliancy of the flowers.—N.
Lycium, L.	Solan.	1735	from *Lukion*, a name given to the Rhamnus by Dioscorides as coming from Lycia in Asia Minor.—N. *Matrimony vine.*
Lycopersicum, Hill.*	Solan.	1765	from *lycos*, a wolf, and *persicon*, a peach-indicating the inferiority of the tomato when compared with the peach.—N. *Tomato or Lovcapple.*
Maba, Forst.‡	Eben.	1776	its native name in Tonga islands.—N.
Macadamia, F. Muell.	Prot.	1858	after John Macadam of Victoria.—N. *Queensland-nut.*
Macaranga, Thou.	Euphor.	1806	a native name.
Machilus, Nees.	Laura.	1831	origin of name obscure.—C.
Macronyx, Dalz.	Leg. P.	1858	from *macros*, and *nyx*, night?
Madacarpus, Wight.	Compo.	1846	from *madas*, to be bald, and *karpos*, fruit; the achenes of *Madacarpus belgammensis* are however hairy.
Madaractis, DC.	Compo.	1837	*madaros*, bald, *aktis*, ray.
Mærua, Forsk.	Capparid.	1775	from an Arabic term?—N.
Mæsa, Forsk.	Myrsin.	1775	from its Arabic name *maas*.
Magnolia, L.	Magnol.	1735	after Pierre Magnol, 1638-1715, a botanist of Montpellier.—N.
Malachra, L.	Malva.	1767	a name used by Pliny.
Malaxis, Soland in Sw.	Orchid.	1778	meaning tenderness.
Malcomia, Br.	Cruci.	1812	after William Malcolm, a London nurseryman who published a catalogue of greenhouse plants in 1771.—N.
Mallea, A. Juss.	Melia.	1830	from the genus Melia, or from *malleus*, a hammer; in allusion to the form of the style and stigma.—Z.
Mallotus, Lour.	Euphor.	1790	*mallotos*, woolly.
Malope, L.	Malva.	1735	an old Greek name for a kind of Mallow.—N.
Malpighia (Plum.) L.	Malpigh.	1735	after Marcello Malpighi (1628-1694) an Italian naturalist and professor at Bologna.—N.

* Durand and Engler-Prantl give Mill, as the author of this genus.
‡ Engler-Prantl give J. R. and G. Forst, as the author of this genus.

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Malva, (Tourn.) L.	.. Malva.	1735..	probably from *Malacho* to soften, in reference to its demulscent properties.—N.
Manettia, (Mut.) L.	.. Rubia.	1771..	after Xavier Manetti, a Florentine botanist of the eighteenth century.—N.
Mangifera, L.† *	.. Anacard.	1747..	bearing the mango fruit.
Manihot, (Tourn.) Adans.	Euphor.	1763..	its Brazilian name. *Cassava or Tapioca plant, and ceara, Rubber Tree.*
Manisuris, SW.	.. Gram.	1788..	from *manis*, a scaly lizard, and *oura*, a tail; allusion?
Mappia, Jacq.	.. Olacin.	1797..	after Professor Marcus Mappus, 1632-1701.—Z.
Maranta, (Plum.) L.	.. Scit.	1737..	after B. Maranti, a Venetian botanist, died 1754.—N.
Mariscus, Gaert.‡	.. Cyper.	1788..	from a Celtic term for a marsh.
Marsdenia, R. Br.	.. Asclep.	1809..	in honour of William Marsden, 1754-1836.—N.
Martinezia, R. & P.	.. Palm.	1794..	after Balthassar Martinez, a Spanish naturalist.—N.
Martynia (Houst.) L.§	Pedal.	1735..	after John Martyn, 1699-1768, Professor of Botany at Cambridge.—N. May be called *Tiger-claws.*
Mastixia, Bl.	.. Corna.	1825..	
Mastostigma, Stocks	.. Asclep.‖	1852..	meaning stigma nipple-like; the style apex is conical, fleshy, much exerted. Syn.—*Glossonema.*
Matricaria (Tourn.) L.	.. Compo.	1735..	so-called from its former use in uterine affections.—N.
Maurandia, Ort.	.. Scroph.	1797..	the correct spelling of the following.
Maurandya, Ort.	.. Scroph.	1837..	after Dr. Maurandy, Professor of Botany at Carthagena.—N.
Mazus,¶ Lour.	.. Scroph.	1790..	from *mazas* a teat; the corolla mouth looks such.—N.
Medicago, (Tourn.) L.†	Leg. P.	1737..	from *medike* and *poa*, geographical name; does the lucerne comes from *Media?* *Alfalfa or Lucerne.*
Melaleuca, L.	.. Myrt.	1767..	*black* stem, and *white* twigs.—*White-tree or Cajupat-tree.*
Melampodium, L.	.. Compo.	1737..	
Melanocenchris, Nees	.. Gram.	1841..	*Melas*, black, *kenchros*, a kind of millet.
Melanthesa, Bl.	.. Euphor.	1825..	black flowered.

* Engler-Prantl give Burm. as the author of this genus.
† Durand and Engler.-Prantl. give Vahl as the author of this genus.
‡ A weed of Mexico.
§ Index Kewensis places this genus under Apocyn.
‖ *Mazus* is excluded by Cooke.
¶

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
*Melanthesiopsis** Benth. & H. F.	.. Euphor.	1880	.. looking like *Melanthesa* because of the dark flowers.
Melastoma, (Burm.) L.	Melastom.	1737	.. the fruit darkens the mouth when eaten.
Melhania, Forsk.	.. Stercul.	1775	.. after Melhan, a mountain in Arabia.
Melia, L.†	.. Melia.	1737	.. Greek for the Ash, applied to this genus because of the resemblance in leaves. *Chinaberry-tree or Persian-lilac.*
Melica, L. ..	.. Gram.	1737	.. from *meli*, honey, referring to the sweet properties of this grass.—C.
Melilotus, (Tourn.) Hall.‡	Leg. P.	1742	.. from *melitos*, honey, and *lotus*.
Meliosma, Bl.	.. Sabia.	1823	.. from *meli*, honey, and *osma*, smell.
Melissa, (Tourn.) L.	.. Labiat.	1737	.. from *melissa*, a bee ; bees are said to gather honey from these plants.—N. *Balm.*
Melochia, (Tourn.) L.	Stercul.	1735	.. from the Arabic name *Melochien*.—Z.
Melothria, L.	.. Cucurbit.	1737	.. *Melothron*, the Greek name for Bryony.
Memecylon, L.	.. Melastom.	1747	.. the Greek name.—N.
Mengea, Schan.	.. Amarant.	1843	.. after Anton Menge, professor at Danzig, who flourished in 1839.—Z.
Mentha, (Tourn.) L.	.. Labiat.	1735	.. the old Latin name.—N. *Mint.*
Menyanthes, (Tourn.) L.	Gentian.	1735	.. *men*, a month, and *anthos*, flower.
Meriandra, Benth.	.. Labiat.	1829	.. *meris*, a part,' *aner*, a male ; the anther-cells are distinct.—C.
Merremia, Dennst.†	Convol.	1818	.. after Blas. Merrem, 1761-1824, a professor of natural science.—Z.
Mesembryanthemum, (Dill.) L.	Ficoid.	1735	.. *mesembria*, midday, and *anthemon*, flower.—N. *Ice-plant or Dew-plant.*
Mesua,§ L. ..	.. Gutti.	1735	.. after two Arabian botanists, Mesue of Damascus.—N.
Methonica, (Tourn.) Crantz. ‖	Lil.	1766	.. altered from *Mendoni*, the Malabar name of the plant.—Z.
Meyenia, Nees †	.. Acanth.	1832	.. after F. J. Meyen, a German botanist.
Mezoneurum, Desf.	.. Leg. Cæs.	1818	.. the pod is broadly winged along the upper suture ; allusion ?
Michelia, L. †	.. Magno.	1737	.. name after P. A. Michele, 1679-1737, a Florentine botanist.—N.
Micranthus, Wendl.	.. Acanth.	1798	.. small flowered.

* *Melanthesopsis*, Muell. Arg. in Cooke.

‡ Juss. in Durand and Engler-Prantl.

§ It is quite different from *Mœsa*, *q. v.*

‖ Juss. in Durand and Engler-Prantl.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Microcarpaea, R. Br...	Scroph.	1810..	from *micros* and *karpos*, in allusion to the very minute capsules.
Microchloa, R. Br...	Gram.	1810..	from *micros* and *chloa*, meaning a small grass ; they are only two to six inches high.
Micrococca, Benth. ..	Euphor.	1849..	the cocci are small.
Micromeria, Benth...	Labiat.	1829..	from *micros*, small, and *merioa*, part ; all parts are very small.
Microptera, Benth. ..	Orchid.	..	.. from *mikros*, small, and *pera*, a pouch ; in allusion to the form of the labellum.—Z.
Microrhynchus, Less...	Compo.	1832..	the achenes look like minute beaks.
Microstachys, A. Juss. .	Euphor.	1824..	the spikes are short.
Microstylis, Nutt.†..	Orchid.	1818..	the column is usually very short with two spreading arms.
Microtropis, Wall. ..	Celas.	1831..	the petals are connate.
Mikania, Willd. ..	Compo.	1803..	after Joseph Mikan, 1743-1814, Professor of Botany at Prague. —N.
Miliusa, Lesch. ..	Anona.	1832..	after J. Milius Vottolinos, who lived in the sixteenth century, author of De Hortorum Cultura. —Z.
Millettia,* W. & A...	Leg. P.	1834..	after J. A. Millet, a French botanist.—N.
Millingtonia, Roxb. ..	Sabia.	1834..	commemorative.
Millingtonia, L. f. ..	Bignon.	1781..	in honour of Thomas Millington, an English botanist.—*Indian Cork-tree.*
Mimosa, L. † ..	Leg. Mimo.	1737..	*mimosa*, mimic ; the leaves mimic animal sensibility.—N. *Sensitive-plant.*
Mimulus, L. ..	Scroph.	1741..	from *mimos*, an actor ; its Latin diminutive is mimulus. *Monkey-flower.*
Mimusops, L. † ..	Sapot.	1747..	from *mimo*, an ape, and *opus*, face; a fanciful resemblance in the flower (Drury).
Mina, Llav. & Lex. ..	Convol.	1824..	synonym *Ipomœa.*
Mirabilis, (Riv.) L. ..	Nyct.	1735..	meaning wonderful.—N. *Four o'clock flower or Marvel of Peru.*
Mitragyne, Korth.†...	Rubia.	1839..	the stigma is mitriform.
Mitrasacme, Labill..	Logan.	1804..	from *mitra*, a mitre, and *acme*, a point ; in reference to the form of the capsule.
Mitreola, L. ..	Logan.	1737..	signifies a small mitre ; the capsule is referred to.
Mniopsis, Mart. & Zucc.	Podostemon.	1822.	from *mnion* and *opsis*, meaning looking like moss.

* In Durand's Index (text) and in Nicholson's Dictionary of Gardening *Milletia*.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Moacurra, Roxb.	.. Euphor.	1814..	the native name.
Modecca, Lam.	.. Passiflor.	1797..	an East Indian name.—N.
Mollugo, L.	.. Ficoid.	1737..	the specific name of *Galium Mollugo* transferred to this genus on account of the general resemblance between the plants. —C.
Momordica, (Tourn.) L. †	Cucurbit.	1735 ..	an East Indian name.—N. *Karla.*
Monechma, Hochst...	Acanth.	1841..	from *monos*, solitary, and *echma*, a home; the two cells of the capsule each contain a solitary seed.—Z.
Monetia, L'Her.	.. Salvador.	1784..	after Jean Baptist Monet de Lamarck, 1744-1829, the great French naturalist.—Z.
Monniera* B. Juss	.. Scroph.	1756..	after Guill. le Monnier, botanist, died in 1880.—Z.
Monocera, Jack.	.. Til.	1820..	meaning a single horn; the anthers are provided with an erect slightly curled or twisted awn (*horn*).
Monochilus, Wall ‡	.. Orchid	1840..	the lip is single in many genera.
Monochoria, Presl. †	Ponteder.	1827..	*monos* and *chorizo*; *one* stamen is *different* from the rest.—N.
Monolophus, Wall.	.. Scitamin.	1830..	from *monos* and *lophos*, having a single crest; the posticous lobe of the corolla is cuccullate.
Monsonia, L.	.. Geran.	1767..	after Lady Ann Monson, a correspondent of Linnæus.—N.
Monstera, Adans.	.. Araceæ.	1763..	not explained by the author.—N. The leaves have holes in them, which is unusual with plants.
Montanoa, Cerv. ‖	.. Compo.	1825..	after Montano, a Mexican politician.—N.
Maricandia, DC.	.. Crucifer.	1821..	after M. E. Moricand, 1780-1854, an Italian botanist.—N.
Morinda, L. †	.. Rubia.	1737..	French *morinde.*
Moringa, Burm § †	.. Moring.	1737..	*morus India*, the Indian mulberry. —N. *Drumstick-tree.*
Morocarpus, S. & Z.	.. Urti.	1846..	bearing fruit resembling Morus or mulberry.
Morus (Tourn.) L.	.. Urti.	1735..	the old Latin name. *Mulberry.*
Moschosma, Reichb...	Labiat.	1828..	from *moschos*, musk, and *osme*, smell; the Bombay species are not odoriferous.
Mucuna, Adans.	.. Leg. P.	1763..	its Brazilian name. *Cowhage or Kawach.*

* *Moniera* in Cooke; and Engler-Prantl give P. Br. as its author.
‡ Bl. in Engler-Prantl.
‖ Llave. and Lex. in Durand and Engler-Prantl.
§ Cooke gives Lam.; and Durand and Engler-Prantl give Juss, as author of Moringa.

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GENUS AND AUTHOR.	NATURAL ORDER.	DATE.	DERIVATION AND COMMON NAME.
Muehlenbeckia, Meisn.	Polygon.	1840..	after Dr. H. G. MUEHLENBECK, 1798-1845, a Swiss physician. —N.
Mukia, Arn. ..	.. Cucurbit.	1841..	said to be an Indian name.—N.
Muldera, Miq.	.. Piper.	1839..	after Johannes MULDERA, a Dutch anatomist.
MUNDULEA, Benth. *†.	Leg. P.	1852..	from *mundulus*, diminutive of *mundus*, cleanly; suggested by the clean style.—Z.
MURRAYA, (Kœn) L. †	Ruta.	1771..	after John Andrew MURRAY, 1740-1791, a Swedish botanist—N. *Curry-leaf.*
MUSA, L. †	.. Scit.	1736..	after Antonius MUSA, the physician of Augustus.—B. and Z. *Banana and Manilla-hemp*; *Arabic Mauz.*—Z.
MUSSÆNDA, (Burm.) L. †	Rubia.	1747..	its Cingalese name.
Myosotis, (Tourn.), (Dill), L.	Borag.	1735..	from *mys, myos*, a mouse, and *ous, otos*, an ear; resemblance supposed in the leaves.—N.
MYRIOPHYLLUM, (Ponted), L.	.. Halorag.	1735..	from *myrios*, myriad, and *phyllon*, a leaf; also *myris*, to flow. *Water-milfoil.*
MYRISTICA, L.†	.. Myristica.	1742..	from *myron*, myrrh; alluding to the fragrance of the seeds.—N.
Myrogyne, Less.	.. Compo. ..	..	from *myron*, myrrh, and *gyne*, female?
Myroxylon, L. f.	.. Leg. P.	1781..	*myron*, an odorous oil, *xylon*, wood. *Peru and Tolu Balsams.*
MYRSINE, L.	.. Myrsi.	1735..	Greek for myrrh.
Myrtus, (Tourn.) L.	.. Myrt.	1735..	*myrtos*, the old Greek name.—N.
Myxopyrum, Bl.	.. Olea.	1825..	*myxa*, slime, and *pyrum*.
Nægelia, Rgl.	.. Gesner.	1848..	after Karl NÆGELI, Professor of Botany at Munich.—N.
NAIAS, L.	.. Naiad.	1735..	from NAIAS, a water-nymph; a habitat name.
Nandina, Thunb.	.. Berber.	1781..	*nandin*, its Japense name.—N.
NANNORRHOPS, Wendl.	Palm.	1879..	*nannos rhops*, a dwarf bush.
NANOTHAMNUS, T. Thoms.	.. Compo.	1867..	*nanos*, dwarf.
NARAVELIA, DC.	.. Ranun.	1818..	from *naravel*, its name in Ceylon.
NAREGAMIA, W. & A.	.. Melia.	1834..	the native Indian name.—Z.
NASTURTIUM, L.‡†	.. Cruci.	1735..	*nasus, tortus*, meaning twisting of the nose, in allusion to the offensive smell of some species. *Water Cress.*
NAUCLEA, L.	.. Rubia.	1762..	*naus*, a ship, and *leio*, to inclose; in reference to the hull-shaped half capsule.—N.
Nechamandra, Pl.	.. Hydrocharit.	1849:	

* DC. in Cooke, Engler-Prantl and Durand.
‡ R. Br. in Cooke and Durand.

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Nectandra, Roland	.. Laurin.	1778..	*nektar*, honey, *aner*, a male.
Nelsonia, R. Br.	.. Acanth.	1810..	in honour of D. Nelson, who accompanied Captain Cook round the world.
Nelumbium* Juss.	.. Nymph.	1789..	its Cingalese name latinised.—N. *Sacred Lotus.*
Nemedra, A. Juss.	.. Melia.	1830..	from *nema*, a thread, and *edra*, seat or base.—Z.
Nemesia, Vent.	.. Scroph.	1803..	an old Greek plant name.—N.
Nemophila, Nutt.	.. Hydrophyll	1882..	from *nemos*, a glade, and *philos*, fond; a habitat name.—N.
Nepeta, (Riv.) L.	.. Labiat.	1737..	from *Nepet*, a town in Tuscany.—Drury. probably from Nepi in Italy.—N. *Cat-mint.*
Nephelium, L. †	.. Sapin.	1767..	an ancient name of the burdock. N.—*Litchi.*
Nephthytis, Schott.	.. Araceæ.	1857..	after Nephthys, the mother of Anubis, the wife of Typhon.—N.
Neptunia, Lour.	.. Leg. Mimo.	1790..	after Neptune, god of the sea; a habitat name.—N.
Nerium, L.	.. Apocyn.	1735..	from *neros*, humid.—N. *Oleander*,
Nesæa, Comm.	.. Lythr.	1789..	said to be from *Nesos*, an island.—N.
Neuracanthus, Nees.	Acanth.	1832..	from *neuron*, a nerve, and *acanthus* after the genus A., the allusion is to the bracts which are strongly nerved.
Neurada, L.	.. Rosa.	1742..	from *neuron*, nerve.—Z.
Neuropeltis, Wall.	.. Convol.	1824..	the capsule occupies the middle of the flat enlarged bract.
Nicandra, Adans	.. Solan.	1763..	after Nicander, of Colophon, who lived about 150 A. D. and wrote on botany.—N. *Apple of Peru.*
Nicotiana, L.	.. Solan.	1735..	after Jean Nicot, 1530-1600, who introduced tobacco into France. N. *Tobacco.*
Niebuhria, DC.	.. Capparid.	1824..	commemorative.
Nimmoia, Wight	.. Lythr.	1837..	after Nimmo, a botanist of India.
Nimmonia, Wight	.. Melia.	1840..	do. do. do.
Nolana, L.	.. Convol.	1762..	from *nola*, a little bell; the corolla is referred to.—N.
Nomaphila, Bl.	.. Acanth.	1826..	from *nomas*, a pasture, and *phileo*, to love; a habitat name.
Nomismia, W. & A.	.. Leg. P.	1834..	*nomisma*, money or coin; in allusion to the form of the pod.—Z.
Nopalea, Salm. Dyck.	.. Cact.	1850..	from the Mexican name of a Cactus.—N.
Noronhia, Stadm.	.. Olea.	1806..	after the Spanish naturalist Fernando de Noronha, who died in 1787 in Isle de France.—Z.
Norysca, Spach.	.. Hyperi.	1836..	the Indian name.—Z.

* Doubtfully indigenous in the Bombay Presidency.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Nothopegia, Bl.	.. Anacard.	1850..	from *nothos*, wrong and *Pegia*, its former name; Pegia is another genus of the same Order.
Nothosærua, Wight *.	Amarant.	1853..	*nothus*, a hybrid?
Notonia, DC.†	.. Compo.	1833..	named after B. Noton of Bombay.
Nyctanthes, L.†	.. Olea.	1737..	from *nyctos*, night, and *anthos*, a flower; the flowers are expanded at night. *Parijatak or tree of sadness.*
Nymphæa, (Tourn.) L. †	Nymph.	1735..	a habitat name; living like a water Nymph. *Waterlily, Egyptian Lotus or Indian Lotus.*
Oberonia, Lindl.†	.. Orchid.	1830..	after Oberon, the Fairy king; in allusion to the quaint forms of the plant.—N.
Obione, Gärtn.	.. Chenopod.	1791..	after the Siberian river Ob or Obi, on the banks of which the plants are at home.—Z.
Ochlandra, Thw.†	.. Gram.	1864..	
Ochna, L.†	.. Ochna.	1737..	the ancient Greek name for wild pear; the leaves resemble.—N.
Ochradenus, Deli.	.. Resed.	1813..	from *ochros*, yellow, and *aden*, a gland (the disk).—Z.
Ochrocarpus‡, Thou.†	Guttifer.	1806..	from *ochro*, and *karpos*, meaning yellow fruits.—N.
Ocimum, L.†	.. Labiat.	1737..	from *ozo*, to smell; the plants are fragrant.—*Basil.*
Odina, Roxb.†	.. Anacard.	1814..	origin uncertain.—C.
Œnothera, L.	.. Onagr.	1735..	*Oinotheras* of Theophrastus. *Evening Primrose.*
Oianthus, Benth.	.. Asclep.	1876..	
Olax, L.	.. Olacin.	1747..	from *olac*, a furrow; the petals are *not* furrowed in the Bombay species.
Oldenlandia, L.	.. Rubia.	1737..	after Henry Beruh. Oldenland, a Danish botanist.—N.
Olea, (Tourn.) L.†	.. Olea.	1735..	the old Latin name.—N. *Olive.*
Oligomeris, Camb.	.. Resed.	1838..	from *oligos* and *meris*; probably referring to the presence of only two petals.
Operculina, Silv. Manso.	.. Convol.	1836..	capsule operculately dehiscent.
Ophelia, D. Don.	.. Gentia.	1837..	from *opheleia*, service; the plant is serviceable as a medicine.
Ophiopogon, Gawl.	Ker-Hæmodor.	1807..	from *ophios* and *pogon*, a serpent's beard; a translation of the native Japanese name.—N. *Snake's-beard.*
Ophiorrhiza,§ L.	.. Rubia.	1753..	from *ophios*, and *rhiza*, the snake-root.

* Nothosærva in Index Kewensis.
‡ *Ochrocarpos* in Cooke.
§ *Ophiorhiza* in Durand.

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Ophioxylon, L.	Apocyn.	1747	from *ophios* and *xylon*; the wood healing snake bites.
Ophiurus, Gärtn. f.*	Gram.	1805	from *ophis* and *oura*, a serpent's tail; the application not understood.
Oplismenus, P. B.†	Gram.	1807	*hoplismenos*, awned.—N.
Opuntia, Mill.**	Cact.	1752	said to be derived from the city of *Opus*.—N. *Prickly-pear.*
Orchis, (Tourn.) L.	Orchid.	1735	the ancient name from *orchis*, testeculus; the analogy is found in the tubers.—N.
Oreodoxa, Willd.	Palm.	1807	*oreos*, a mountain, and *doxa*, glory. —N. *Royal Palm.*
Origanum, (Tourn.) L.	Labiat.	1735	*Oreiganon*, mountain-pride (Drury); the ancient Greek name.—N. *Sweet Marjorum.*
Orobanche, (Tourn.) L.	Orobanch.	1735	derived from *orobus*, a vetch, and *ancho*, to strangle; some species are parasitic on vetches.—C.
Oropetium, Trim.	Gram.	1820	from *oros*, mountain, and *pegnumi*, fastening; a habitat name.—Z.
Orophea, Bl.	Anona.	1825	from *orophe*, the top of anything; with reference to the united top of the inner petals.
Oroxylum,‖ Vent.	Bignon.	1808	*oros xylon*, mountain wood; a habitat name.—N.
Orthosiphon, Benth.	Labiat.	1830	from *orthos*, straight, and *siphon*, a tube; the allusion is to the corolla tube.
Orygia, Forsk.	Ficoid.	1775	altered from *Horudjrudj*, the Arabic name of the plant.—Z.
Oryza, L.†	Gram.	1735	from Arabic *Eruz*.—N. *Rice.*
Osbeckia, L.	Melastoma.	1753	after Peter Osbeck, 1723-1805, a Swedish naturalist.—N.
Osmanthus, Lour.	Olea.	1790	from *osme* and *anthos*; perfumed flowers.—N.
Osyris, L.	Santa.	1735	from *ozos*, a branch; the plant is twiggy. *Poet's-cassia.*
Ottelia, Pers.†	Hydrochar.	1805	probably from its Malabar name. —N.
Ougeinia, Benth.	Leg. P.	1851-55	from Ujjain, a town in Central India, whence seeds were sent to Dr. Roxburgh.—C.
Oxalis, L.†	Geran.	1737	from *oxys*, sharp; in allusion to the sharp acid taste.—N. *Wood-sorrel.*
Oxystelma, R. Br.	Asclep.	1809	from *oxys*, sharp, and *stelme*, a girdle; the corona has acute points.—N.

* Gartn. in Cooke, Durand, Engler-Prantl.
** Haw. in Engler Prantl.
‖ Oroxylon in Index Kewensis.

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Oxytenanthera, Munro.	Gram.	1868..	the filaments are connate in an ultimately elongated membranous tube.
Pachira, Aubl.	Malva.	1775..	its native name in Guiana.—N.
Pachyrhizus, Rich.	Leg. Papil.	1825..	from *pachys*, thick, and *rhiza*, root.
Pajanella, DC.	Bignon	1838..	Malabar name latinized.
Palaquium, Blanco...	Sapot.	1837..	from a vernacular name.
Paliurus, (Tourn.) Mill*	Rham.	1752..	the old Greek name used by Theophrastus.—N.
Palmia, Endl. ..	Palm.	1839..	after L. H. *Palm*, author of The Climbing of Plants, Stuttgart, 1827.—N.
Panax, L. ..	Aralia.	1735..	*panakes* meaning panacea.—N.
Pancratium, (Dill.) L†	Amaryll	1735..	from *pan* and *kratys*, all potent; a medicinal name.
Pandanus, (Rumph.) L. f. †	Pandan.	1781..	from Malayan *pandang*, conspicuous. *Screw-pine.*
Pandorea, Spach.** ..	Bignon.	1840..	from *pan*, whole, and *deros*, a membrane; in allusion to the leaves.—Z. The leaves are *not* simple.
Panicum, L. † ..	Gram.	1735..	from *panis*, bread; or from *panicula*, a panicle (Drury) the old Latin name.—N.
Panjanella, DC. ..	Bignon. ..	..	from its Malabar name.
Papaver, (Tourn.) L ..	Papaver.	1737..	an old Latin name.—N. *Opium Poppy.*
Pappophorum, Schreb...	Gram.	1791..	the lower involucral glume *bears* down or *pappum*.
Papyrus, Willd. ..	Cyper.	1812-13..	an old Greek name.—N.
Paracaryum, Boiss. ..	Borag.	1849..	from *para*, beside, and *caryon*, a nut.—N.
Paramignya, Wight..	Ruta.	1838..	from *para*, beside.
Paratropia, DC. ..	Aralia.	1830..	from *para* and *tropis*, like a keel?
Pardanthus, Ker.-Gawl	Irid.	1805..	from *pardos*, a leopard, and *anthos*, a flower; the flowers are spotted.—N.
Parietaria, (Tourn.) L.	Urti.	1735..	from *paries*, a wall; because it grows on old walls.—C.
Parinarium, Aubl. ..	Rosa.	1775..	from its native name in Brazil.—N.
Paritium, A. Juss‡ ..	Malva.	1827..	from the Malabar name of the plant.—Z.
Parkia, R. Br. ..	Leg. Mimo.	1826...	in honour of Mungo Park, 1771-1805, the celebrated African traveller.—N.
Parkinsonia, (Plum.) L.†	Leg. C.	1737..	after John Parkinson, 1567-1629, an apothecary of London.—N *Jerusalem Thorn.*

* Juss. in Engler-Prantl.
** Seem. in Durand.
‡ St. Hil. in Durand and Engler-Prantl.

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Parmentiera, DC.	Bignon.	1838	after A. Parmentier, 1737-1813, a French writer on plants.—N. *Candle-tree.*
Parsonsia, R. Br.	Apocyn.	1809	after Dr. John Parsons, a Scotch naturalist, 1705-1770.—N.
Paspalum, L.†	Gram.	1759	from the Greek term for a millet.
Passiflora, L.	Passiflor.	1735	from *passio*, passion, and *floris* a flower; a name given by the early missionaries, the flower being supposed to, represent the implements of the Crucifixion.—N. *Passion-flower.*
Pastinaca, L.	Umbel.	1737	
Pavetta, L.†	Rubia.	1747	a Malabar name.—N.
Pavonia, Cav.*	Malva.	1786	after Don Jose Pavon, a Spanish traveller in Peru, died in 1344.—N.
Pedalium, (Royen.) L.	Pedal.	1759	from *pedalion*, a rudder; in reference to the dialated angles of the fruit.
Pedicularis, (Tourn.) L.	Scroph.	1735	from *pediculus*, a louse; from its supposed quality of making sheep lousy that fed on it. *Lousewort.*
Pedilanthus, Neck.	Euphor.	1790	from *pedilon*, and *anthos*, shoe flower; the name is very appropriate. *Jew-bushor Slipper-spurs.*
Peganum, L.	Zygophyll.	1735	the old Greek name.—N.
Pelargonium, L'Her.	Geran.	1787	from pelargos, a stork.—N. *Stork's-bill.*
Peliosanthes,‡ Andr.	Hæmodor.	1808	from *pelios* and *anthos* meaning livid flowers.
Pellionia, Gaud.	Urti.	1826	after A. M. J. Alphonse Pellion who voyaged round the world with Freycinet.
Peltophorum, Walp.‖	Leg. Cæs.	1842	*peltis*, a shield, *phero*, I bear.
Pennisetum, Rich.¶	Gram.	1805	from *penna*, a feather, and *setum*, a bristle.
Pentapetes, L.	Stercul.	1747	meaning *five* leaved flower.—N.
Pentaptera, Roxb.	Combret.	1814	the drupe has five wings.
Pentas, Benth.	Rubia.	1844	cf. *Pentapetes.*
Pentatropis, R. Br.	Asclep.	1814	from *pente*, and *tropis*, a keel; in allusion to the five coronal keels.
Peperomia, R. & P.	Piper.	1794	*peperi*, *omoios*, similar to pepper.—N.
Peplidium, Del.	Scroph.	1813	from *Peplis*, purslane.
Pereskia, (Plum.) L.	Cact.	1735	after Nicholas F. Peresk of Provence.—N.

* *Pavonia* L. in Engler-Prantl.
‡ Excluded by Cooke.
‖ Peltophorum Vog. in Durand and Engler-Prantl.
¶ Pennisetum Pers, in Cooke, Durand and Engler-Prantl.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Pergularia, L. †	.. Asclep.	1767..	from *pergula*, trellis work; because of the fitness of the plant to be trained on it. *Cowslip-creeper.*
Perilla, L.	.. Labiat.	1764..	said to be an Indian name.—N.
Periploca, (Tourn.) L.	Asclep.	1737..	from *peri* and *ploce;* twining around.
Peristrophe, Nees	.. Acanth.	1832..	from *peri*, around, and *strophe*, a turning; alluding to the anthers which are twisted when old. *Milkvine.*
Peristylus, Bl. *	.. Orchid.	1825..	from *peri*, around, and *stylis*.
Perotis, Ait.	.. Gram.	1789..	from *peros*, deficient; the allusion is not understood. Cf. *Eclipta.*
Persea, (Plum.) L.‡	.. Laurin.	1737..	an ancient Greek name.—N. *Avocado-pear.*
Petalidium, Nees.	.. Acanth.	1832..	from *petalos*, broad, flat; referring to the conspicuous bracteoles.—C.
Petrea (Houst.) L.§	.. Verben.	1737..	after Robert James Lord Petre, who died in 1742.—N. *Purple-wreath.*
Petroselinum, Hoffm.	.. Umbel.	1814..	*petra*, a rock, *selinon*, parsley; because it grows amongst rocks and in stony places.
Petunia, Juss.	.. Solan.	1803..	from Brazilian *Petun*, tobacco; an affinity name.—N.
Peucedanum, (Tourn.) L. †	Umbel.	1735..	the old Greek name used by Hippocrates.—N.
Phacelia, Juss.	.. Hydrophyll.	1789.	from *phakelos*, a fascicle (of flowers).—N.
Phajus, Lour.	.. Orchid.	1790..	from *phaios*, shining, that is beautiful.
Phalangium, Adans.	.. Lil.	1763..	from *phalanx*, a venomous spider; whose bite the plants are said to cure.
Phalaris, L.	.. Gram.	1735..	the old Greek name used by Dioscorides.—N. *Gardener's Garter.*
Pharbitis, Choisy.	.. Convol.	1833..	meaning not known.
Phaseolus, (Tourn.) L.†	Leg. P.	1735..	probably from *phaselus*, a little boat.—N. *Double, French and other Beans.*
Phaylopsis, Willd.	.. Acanth.	1800..	*phaulos*, worthless, *opsis*, appearance.
Phelipæa, Desf.	.. Orobanch.	1807..	in honour of the family of Philipeaux, patrons of the botanist Tournefort.—N.
Phillyrea, L.	.. Olea.	1737..	
Philodendron, Schott.	.. Araceæ.	1829..	from *philos*, fond, and *dendron*, a tree; a tree climber.

* Durand gives *Peristylis*.
‡ Persea Gartn. in Durand and Engler-Prantl.
§ *Petræa* in Engler and Prantl.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Phlogacanthus, Nees..	Acanth.	1832..	from *philox*, a flame, and *akantha*; the flowers are brilliant.
Phlox, L.	.. Polymon.	1737..	*phlox* flame.
Phoberos, Lour.	.. Bixa.	1790..	from *phoberos*, frightful; in allution to the axillary spines.—Z.
Phœnix, L.†	.. Palm.	1735..	the Greek name for the date. *Date Palm.*
Pholidota, Lindl.†	.. Orchid.	1825..	from *pholis*, a scale, and *otis*, an ear; the bracts are referred to.—N.
Phragmites, Trin.†	.. Gram.	1820..	from *phragmos*, a hedge; the name relates to the use of the plants.
Phrynium, Lœfl.*	.. Scit.	1758..	from *phrynos*, a frog; the plants inhabit marshes.
Phyllanthus, L.†	.. Euphor.	1737..	from *phyllon*, a leaf, and *anthos*, a flower; the flowers are formed on cladophylls.
Phyllarthron, DC.	.. Bignon.	1840..	*phyllon, arthros*; jointed, *i.e.*, compound leaves.—N.
Phyllocactus, Link.	.. Cacat.	1831..	the stem is leaf-like.
Physalis, L.†	.. Solan.	1735..	from *physa*, a bladder; the allusion is to the membraneous calyx.—*Cape-gooseberry.*
Physichilus, Nees.	.. Acanth.	1836..	from *physis*, a bladder; and *cheilos*, a lip; the lower corolla lip is bullate.
Physorhynchus, Hook.	Cruci.	1852..	*phusa*, wind, *i.e.* inflated, *rhynchos*, beak?
Pierardia, Roxb.	.. Euphor.	1814..	commemorative.
Pilea, Lindl.	.. Urti.	1821..	from *pilos*, a cap; the perianth is such.—N. *Artillery-plant.*
Pimpinella, (Riv.) L.	Umbel.	1735..	said to be altered from *bipinnula*, twice pinnate.—N. *Anise.*
Pinanga, Bl.†	.. Palm.	1836..	a local Malayan name.—N.
Piper, L.†	.. Piper.	1737..	the old Latin name.—N. *Betel-leaf Vine.*
Piptostylis, Dalz.	.. Ruta.	1851..	from *pipto*, to fall, and *stylos*; the style is deciduous.
Piscidia, L.	.. Leg. Papil.	1759..	*piscis cædo*; killing (intoxicating) fish.—N.
Pisonia, (Plum.) L.†	.. Nyct.	1737..	after Wiltem Piso, a physician of Amsterdam, who died in 1648.—N. *Tree Lettuce.*
Pistia, L.†	.. Araceæ.	1737..	probably from *pistos*, watering.—N. The plants are aquatic. *Water Lettuce.*
Pisum, (Tourn.) L.	.. Leg. Papil.	1735..	the old Latin name used by Virgil.—N. *Peas.*
Pitcairnia, L'Her.	.. Bromel.	1788..	after W. Pitcairn, a physician of London.—N.

* Phrynium. Willd. in Cooke and Engler-Prantl. and Durand.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Pithecolobium, Mart.†	Leg. Mimo.	1837	*pithecos lobos*, the monkey's ear lobe; a local name translated. —N. *Rain-tree.*
Pittosporum, Banks	Pitto.	1788	from *pitta*, pitch, and *sporos*, seed.—N.
Pladera, Soland.*	Gentian.	1814	from *pladeros*, abounding in juice.
Plantago, (Tourn.) L.	Planta.	1735	from *planta*, the sole of the foot; in allusion to the shape of the leaves.
Platanthera, Rich.†	Orchid.	1818	from *platys* and *anthera*; flat anthers.
Platea, Bl.	Olacin.	1825	from *platys*, flat.
Platychæte,‡ Boiss	Compo.	1849	from *platys* and *chiton*, a flat tunic; the inner pappus is flattened.
Platystoma, P. B.§	Labiat.	..	meaning flat mouth; the corolla tube is widely campanulate at the mouth.
Plecospermum, Trec	Urti.	1847	*pleco*, to twine, and *spermum*; one cotyledon is very large and it embraces the smaller one.
Plectranthus, L'Her†	Labiat.	1785	from *plectron*, a spur, and *anthos*, a flower; in reference to the corolla being gibbous above the base
Plectronia, L.	Rubia.	1767	from *plectron*, a spur; there is no spur in the Bombay species.
Pleurogyne, Esch.‖	Gentian.	..	..
Pleurostylia, W. & A.	Celastr.	1834	*pleuron*, a side, and *stylis*; the style is lateral.
Pluchea, Cass.	Compo.	1817	after N. A. Pluche, who published the "Spectacle de la Nature" at Paris in 1732.—N.
Plumbago, (Tourn.) L.†	Plumb.	1735	from *plumbum*, a disorder of the eyes, which some species were formerly said to cure (Drury); *plumbum*, a medicinal name.—N.
Plumeria, (Tourn.) L.	Apocyn.	1735	after Charles Plumier, 1646-1706, a French botanist.—N. *Khair-champa.*
Poa, L.	Gram.	1737	a Greek name for grass.
Podostemon, Mchx.	Podostemon.	1803	*pous*, a foot, and *stemon*, a stamen.
Pogonatherum, P. B.	Gram.	1812	Racemes solitary on long flexuous peduncles, *plumose* from the slender awns; the upper involucral and the upper floral glumes are awned.

* Pladera is a synomum of Hoppea; and its author is given by Durand and Engler-Prantl as Griseb.

‡ *Platychæta* in Durand, and Index Kewensis.

§ Playstome Benth. and Hook. f. 1876, and Platostoma Beauv. 1805, in Index Kewensis.

‖ Pleurogyne Griseb. 1839; Pleurogyna Esch. 1826 in Index Kewensis, the latter is omitted in Engler and Durand and adopted in Index Kewensis.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Pogonia, Juss. †	.. Orchid.	1789..	from *pogonias* bearded; the lip is *not* fringed or bearded in the Bombay species.
Pogostemon, Desf. †..	Labiat.	1815..	from *pogon*, a beard, and *stemon*, a stamen; only some of the Bombay species have villous stamens. *Patchouli.*
*Poinciana** (Tourn.) L.†	Leg. Cæs.	1735..	after M. de Poinci, Governor of Antilles.—N. *Gulmohor or Flame-of-the-forest.*
Poinsettia, R. Grah ..	Euphor.	1836..	in honour of Dr. Poinsett.
Poivrea, Comm.	.. Combret.	1806..	after Poivre, a French traveller.
Polanisia, Raf.	.. Capparid.	1818..	*polys anisos*; many unequal stamens.—N.
Polianthes, Jacq.	.. Amaryll.	1737..	many flowered. *Tuberose (meaning tuberous and not tube-rose.)*
Pollinia, Trin. †	.. Gram.	1833..	named after Ciro Pollini, an Italian physician and professor of botany, who died in 1833.—C.
Polyalthia, Blum.†..	Anona.	1829..	from *polys* many, and *althecis*, healthy. *Asopalav.*
Polycarpæa, Lamk.	Caryophyll.	1792..	the capsules are numerous.—C.
Polycarpon, Lœfl ‡..	Caryophyll.	..	*polys*, many, and *carpos*, fruit.
Polygala, (Tourn.) L.	Polygal.	1735..	having the property of promoting much milk, *polysgala*.—N.
Polygonum, (Tourn.) L. †	Polygon.	1735..	from *polys* and *gonu*, in allusion to the many knees or joints of the stem. *Adderwort.*
Polyscias, Forst.	.. Aralia.	1775..	*Polys*, many, *skias*, shade.
Polytoca, R. Br.	.. Gram.	1838..	*polys*, many, *tokas*, a bringing forth?
Polyzygus, Dalz.	.. Umbel.	1850..	*polys* and *zygon*, many yokes?
Pongamia,§ Vent.†	.. Leg. Papil.	1803..	adapted from the Malabar name. *Karanj-oil-tree or Indian-beech.*
Pontederia, L.	.. Ponteder.	1735..	after J. Pontedera, 1688-1757, Professor of Botany at Padua.—N.
Populus, L.	.. Sali.	1735..	the ancient Latin name.—N.
Porana, Burm. f. †	.. Convol.	1768..	from *poreno*, to journey; in allusion to the extensive branches—D.; supposed to be derived from the Javanese name of *P. volubilis*.—C. *Bridal creeper.*
Porpax, Lind. †	.. Orchid.	1845..	from *porpe*, the handle on a shield, a hook, or ring.—Z.
Portulaca, L. †	.. Portu.	1735..	the old Latin name.—N. *Purslane.*

* Doubtfully wild in the Bombay Presidency.

‡ Polycarpon L. in Cooke and Durand.

§ See Cooke's Bombay Flora, I, 402, regarding the diversity of opinion as to the name which should be borne by this genus.

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GENUS AND AUTHOR.	NATURAL ORDER.	DATE.	DERIVATION AND COMMON NAME.
Portulacaria, Jacq.	Portu.	1786	resembling *Portulaca*.—N. *Purslane-tree.*
POTAMOGETON, (Tourn.) L.	Naiad.	1735	from *potomas*, a river, and *geiton*, near; after the habitat. *Pond-weed.*
POTENTILLA, L. †	Rosa.	1735	a diminutive of *potens*, powerful; a medicinal name.—N.
Pothomorphe, Miq.	Piper.	1840	having the form of *Pothos*.
POTHOS, L. †	Araceæ.	1747	a Cingalese name.—N.
POUZOLZIA, Gaud.	Urti.	1826	in honour of M. P. C. de POUZOLZ, a French botanical author of the nineteenth century.—C.
PREMNA, L.	Verben.	1771	from *premnon*, the stump of a tree; because of the small size of the tree.—N.
Prenanthes, (Vaill.) L.	Compo.	1737	from *prenes*, drooping, and *anthos*, flower; referring to the drooping flower heads.—N.
Prestonia, R. Br.	Apocyn.	1809	after C. PRESTON, a correspondent of Ray.—N.
Prinsepia, Royle.	Rosa.	1834	in honour of James PRINSEP, formerly Secretary of the Asiatic Society, Bengal.—C.
PRITCHARDIA, Seem. & Wendl. †	Palm.	1861	after George PRITCHARD, who explored the islands of the Pacific Ocean.*
PRIVA, Adans.	Verben.	1763	meaning unknown.—N.
Procris, (Comm.) Juss.	Urti.	1789	from *prokrinein*, favour; referring to the fine growth and inflorescence of the plant.—Z.
PROSOPIS, L.	Leg. Mimo.	1767	meaning obscure.—B. The ancient Greek name used by Dioscorides (IV 102) and Pliny (XXV 66) for the Butterbur. The name is derived from *prosopon*, face or mask, referring to the lower lip.—Z.
Prosorus, Dalz.	Euphor.	1852	an old Greek name.—N.
Protium, W. & A.	Burser.	1834	believed to be the native name in Java. The nomenclator gives no information.—Z.
Prunus, (Tourn.) L.	Rosa.	1735	the ancient Latin name of the Plum.—N.
PSEUDANTHISTIRIA, Hook. f.	Gram.	1897	the false *Anthistiria*, which is a related genus.
Pseudanthus, Wight.	Amarant.	1852	from *pseudo*, false, and *anthos*, flower.
PSEUDARTHRIA, W. & A.	Leg. Papil.	1834	falsely jointed; the pod is linear, oblong, flat, continuous within, not jointed, the faces transversely veined.

* B. N. H. S. Journal, Vol. XXI, p. 357.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Psidium, L.	.. Myrt.	1737..	from *psidion*, Greek for the Pomegranate.—N. *Guava.*
Psilostachys, Hochst.	Amarant.	1844..	from *psilos*, bare, and *stachys*, a spike.
Psilotrichum, Bl.	.. Amarant.	1825..	from *psilos*, naked, and *thrix*, a hair; the reference not understood.
Psophocarpus, Neck...	Leg. Papil.	1790..	*psophos*, a sound, *carpos*, fruit. *Chaudhari.*
Psoralea, L.	.. Leg. Papil.	1742..	*psoraleos*, warted; the leaves are such.—N.
Psychotria, L.	.. Rubia.	1759..	*psyche*, life; a medicinal name.—N.
Pterocarpus, L.	.. Leg. Papil.	1747..	from *pteron* and *carpos*; the pods are winged.—*Burmese Rosewood or Red wood-tree.*
Pteropyrum, Jaub. & Spach.	.. Polygon.	1846..	from *pteron* and *pyren*, meaning winged kernel; the nut is broadly three-winged.
Pterosperum, Schreb †	. Stercul.	1791..	*pteron sperma*; the seeds are winged.
Ptychosperma, Labill..	Palm.	1809..	the albumen is ruminated.—N. *Australian Feather Palm.*
Ptychotis, Koch.	.. Umbel.	1824..	from *ptyche*, a fold.
Pueraria, DC.	.. Leg. Papil.	1825..	after M. M. N. Puerari, Professor of Botany at Copenhagen.—N.
Pulicaria, Gärtn.	.. Compo.	1719..	from *pulex*, a flea; used as a flea-bane.
Puneeria, Stocks.	.. Solan.	1849..	from *panir*, Hindustani for cheese.
Punica, (Tourn.) L.	.. Lythr.	1735..	from *Punicus*, another name for Carthage, probably with some allusion to *puniceus*, scarlet.—N. *Pomegranate.*
Pupalia, Juss.	.. Amarant.	1803..	said to be a native name in India.—N.
Putranjiva, Wall †	.. Euphor.	1826..	an Indian term meaning life of the son; a medicinal name.—N.
Pycnospora, R. Br.	.. Leg. Papil.	1834..	with clustered spores, allusion?
Pycnostachys, Hook..	Labial.	1827..	with densely clustered flower spikes.
Pycreus, P. B.	.. Cypher.	1807..	an anagram of Cyperus in which genus the species are placed by most botanists.—C.
Pygeum, Gärtn.	.. Rosa.	1888..	
Pyrethrum, Hall.*	.. Compo.	1742..	probably from *pyr*, fire; the roots are acrid.—N.
Pyrostegia, Presl.	.. Bignon.	1844..	from *pyros*, fire, and *stege*, a covering.
Pyrularia, Mchx.	.. Santal.	1803..	a diminutive of *Pyrus*, the pear.—N.

* Pyrethrum DC. in Engler-Prantl.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Pyrus, (Tourn.) L.	Rosa.	1735	the old Latin name used by Pliny.—N. *Pear*.
Pythonium, Schott.	Aracea.	1832	python.
Quamoclit, Moench.	Convol.	1794	from *Kyamos*, a Kidney-bean, and *klitos*, dwarf; the plant is a climbing one.
Quisqualis, L.	Combret.	1762	*quis*, who, *qualis*, of what kind; points to the uncertainty as to what class or order the genus belonged when the name was given.—N. *Rangoon-creeper*.

(*To be continued.*)

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BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA, BURMA AND CEYLON.

Report No. 23. Sikkim and Bengal Terai.

With a Map.

By R. C. Wroughton.

Collection	... ...	No. 23.
Locality	... ...	Sikkim and Bengal Terai.
Date	... ...	October 1914—April 1915.
Collected by	... ...	Mr. C. A. Crump.

Earlier Reports ... ... No. 1, East Khandesh, Vol. XXI, p. 392, 1912; No. 2, Berars, Vol. XXI, p. 820, 1912; No. 3, Cutch, Vol. XXI, p. 826, 1912; No. 4, Nimar, Vol. XXI, p. 944, 1912; No. 5, Dharwar, Vol. XXI, p. 1170, 1912; No. 6, Kanara, Vol. XXII, p. 29, 1913; No. 7, Central Provinces, Vol. XXII, p. 45, 1913; No. 8, Bellary, Vol. XXII, p. 56, 1913; No. 9, Mysore, Vol. XXII, p. 283, 1913; No. 10, Kathiawar, Vol. XXII, p. 464, 1913; No. 11, Coorg, Vol. XXII, p. 486, 1913; No. 12, Palanpur, Vol. XXII, p. 684, 1913; No. 13, South Ceylon, Vol. XXII, p. 700, 1913; No. 14, N. Shan States, Vol. XXII, p. 710, 1913; No. 15, Kumaon, Vol. XXIII, p. 282, 1914; No. 16, Dry Zone, Central Burma and Mt. Popa, Vol. XXIII, p. 460, 1915; No. 17, Tennasserim, Vol. XXIII, p. 695, 1915; No. 18 Ceylon, Vol. XXIV, p. 79, 1915; No. 19, Bengal, Vol. XXIV, p. 96, 1915; No. 20, Chindwin River, Vol. XXIV, p. 291, 1916; No. 21, Gwalior, Vol. XXIV, p. 309, 1916; No. 22, Koyna Valley, Vol. XXIV, p. 311, 1916.

This Collection contains representatives of two markedly distinct faunas, *viz.*, that of the Gangetic Plain and that of the Himalayas. In this respect it somewhat resembles the collection from Kumaon, but the dividing line seems to be more sharply marked in the present case, and the Himalayan species show signs of colour relationship with the more eastern types. Thus *Vulpes bengalensis* and *Funambulus pennanti* are characteristic of the plains fauna while *Vulpes montana*, *Ochotona* and *Microtus* are exclusively Himalayan, the *Ochotona* however is different from that in the Kumaon Collection, which is more closely related to the form of the Western Himalayas.

The general configuration of this part of the Himalayas is too well known to require detailed description but I should like to call attention to the sudden rise in altitude which seems to be reflected in the abrupt change in the fauna that I have noted above. Up to and beyond Siliguri the general altitude is only about 200 feet, yet Ghoom and Darjeeling more than 7,000 feet, are within 15 miles as

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the crow flies. From Darjeeling northwards the whole country is a confused network of valleys and hills, the latter ever growing higher, up to Kinchingunga with its 28,000 feet altitude, and nest of glaciers.

The collecting work was carried on for the most part northwards along the course of the Tista River but explorations were also made to the Nepal border at Tonglu, Sukiapokhri and to the Bhutan border at the Jelap La. The most northerly point reached was Thangu (12,000'-13,000') in the valley of the Lachen River, one of the early tributaries of the Tista.

The following are details of the places visited, taken from Mr. Crump's notes:—

"Starting from Gangtok (the capital of Sikkim) a charming station situated on the western face of a long ridge and commanding an extensive view of the Kinchingunga snow range, I ascended from 6,000 to 12,800 feet *via* Karponang and Changu to Kapup, returning *via* Gnatong, Sedonchen, Rongli and Payong.

Kapup.—Situated within a few miles of the Jelap La which crosses into the Chumbi Valley, lies on a large open saddle, connecting peaks on the Gnatong side with those forming the boundary between Sikkim and Chumbi. The sterile rockstrewn slopes are dotted with patches of rhododendron in the more sheltered places, and a large variety of Alpine growths give life and colour to the otherwise dreary scene. The vista of distant peaks is exceedingly grand but serves rather to accentuate the deserted appearance of one's immediate surroundings. On one side of the saddle is a fine lake, forming the source of the Jaldaka River, which flows towards Bhutan. The upper limit of trees is some distance below Kapup, but in valleys well sheltered from the searching winds which sweep across these heights, tall conifers do well up to an elevation of 12,000 feet. During my visit in October the ground was frost bound, and several falls of snow were experienced.

Gnatong.—From Kapup the distance to this valley is five miles over a pass followed by a descent to 12,300 feet. The conditions are similar to those at Kapup except that the valley, being sheltered by a high ridge to the north, vegetation is more prolific and the upper line of forest is at a higher elevation. Rhododendrons and birches are abundant and the conifers appear to be very robust, while below 12,000 feet a thick undergrowth of bamboo begins to appear.

Sedonchen.—From Gnatong the road is fairly level for four miles, after which there is a drop of about 5,000 feet in five miles. Sedonchen is a small village at an elevation of about 7,000 feet, surrounded by a few fields in which buck wheat is grown.

The slopes are all exceedingly steep and clothed with heavy forest, including pine, oak, maple, walnut, and any quantity of

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bamboo. The place was infested with leeches, which fastened on to my legs in numbers and left uncomfortable sores.

Rongli.—Situated about eight miles from Sedonchen at an altitude of 2,700 feet. Here the valley broadens out and cultivation becomes more general, a fair quantity of rice being grown on low lying ground. Dense tropical forest clothes the valley and hillsides, the change being marked on the road down by the appearance of figs, tree-ferns, bananas, groves of orange trees and the cultivation of cardamoms.

Dikchu.—A village 13 miles north-west from Gangtok at an elevation of 2,000 feet, situated at the junction of the Dikchu stream with the Tista, where both valleys narrow almost to gorges. The surrounding slopes are steep and clothed with dense tropical forest. Figs abound, as also do bananas, growing in large patches and in such profusion that other vegetation of any size is excluded. On the hill sides tree-ferns are to be seen, and dense undergrowth contains quantities of very large leafed and virulent nettles the sting from which is very painful and imparts an irritation lasting for several days. Orange trees are cultivated here and yield a plentiful supply of excellent fruit.

Singhik (or Singtam).—A village ten miles north from Dikchu, the valley near Singhik makes a sweep to the east and opens out into a beautiful broad expanse which admits of a fairly extensive cultivation of rice. The tropical forest bordering the river mingles with that of the more temperate zones on the upper slopes. I noticed bamboo, plantain and various palms, fig, birch, walnut, tree-ferns, nettles, and wild strawberries, the last growing in profusion. Mica schists appear here in large quantities, the soft powdered soil on the road showing a big proportion of glittering particles.

Ringni.—Is situated at 6,000 feet on one of the hills to the east and facing Singhik.

Chuntang.—At an altitude of 5,350 feet and 14 miles north-east by road from Singhik, this small village is situated at the junction of the Lachen and Lachung streams. The Lachen is here confined for about 50 yards by massive walls of solid rock only a few yards apart, through which the torrent rushes with incredible force. A very marked change occurs in the flora at Chuntang, a phenomenon which has been recorded by Sir J. Hooker in his "Himalayan Journals" as follows :—

"There is a great difference between the vegetation of Darjeeling and that of similar elevations near Chungtam, situated far within the Himalaya; this owing to the steepness and dryness of the latter locality, where there is an abundance of dense forest which is replaced by a number of social grasses clothing the mountain sides, many new and beautiful kinds of rhododendrons and a variety of European genera, which are either wholly absent from the damp ranges of Darjeeling or found there several thousand feet

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higher up. On the hill above Chungtam, I gathered at 5,000 to 6,000 feet *Rhododendron arboreum* and *dalhousiæ*, which do not generally grow at Darjeeling below 7,500 feet whilst on the outer ranges (as on Tonglo) it is only found at 9,000 to 10,000 feet; and where as on Tonglo it forms an immense tall tree, with long sparse branches and slender drooping twigs, growing amongst gigantic magnolias and oaks, at Chungtam it is small and rigid and much resembling in appearance our church-yard yew. At 8,000 feet the *Abies brunoniana* is found, a tree quite unknown further south; but neither the larch nor the *Abies smithiana* (Khutrow) accompanied it, they being confined to still more northern regions."

The rock of this area is mainly gneiss and micaceous schists, the soil is good clay. There is a cultivation of millet and maize; rice is grown near the river but not any higher up the valley.

Lachen (or *Lamteng*).—Situated slightly west of north from Chantung, at a distance of 12 miles, and an elevation of 8,000 feet. The ascent of 3,500 feet from Chuntang is gradual until a stiff climb is encountered, up a huge ancient moraine which stretches across the valley. The inhabitants are mostly Tibetans, who spend the summer months tending their flocks high up near the Tibetian border and using Lachen only as winter quarters. The neighbouring mountains are clothed with grand forest of fir, spruce, larch, oak, birch, walnut, &c., also bamboo, rhododendrons, elder and currant bushes. Cultivation does not seem to be a strong point with these people, for the fields, which are few in number, appeared to be very roughly cleared and ill kept. I understand that buck-wheat and turnips form the principal crops. On the northern slopes a good deal of snow was lying, and in such situations is permanent throughout the winter.

Thangu.—This was my most northern camp; it is 12,000 feet above the sea level and 13 miles due north of Lachen. The village contains a few huts, occupied only during the summer months. It is situated in a spacious valley, where the Thanguchoo stream joins the Lachen. The grassy slopes surrounding the village are of easy gradient, but many are crowned with precipices studded with spike-like peaks. This high ground lying north of Lachen is, I understand, the driest area in Sikkim and has more similarity with the dry climate of Tibet. In January at such a high altitude the cold was intense but I found the dry clear atmosphere wonderfully invigorating. Barhal were exceedingly plentiful and during my search for 'heads' I ascended to about 16,000 feet, from which elevation the panorama of snow fields and peaks is so wonderful that I frequently forgot the business in hand while in enthusiastic contemplation of the 'views.' These excursions were sometimes prematurely terminated by the biting winds which it was impossible to face for long at a time. The Lachen and

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Thanguchoo streams had a fair flow of water but were frozen solid at the sides; smaller streams were quite frozen up. Mountains and valleys were under snow, though to no great depth, which considering the altitude and the time of the year, indicates a much decreased humidity. Of the vegetation Sir J. Hooker writes:—"After leaving Tallum, the valley contracts, passing over great ancient moraines and again expanding wider than before into broad grassy flats. The vegetation rapidly diminishes in stature and abundance and though the ascent to Tunga is trifling, the change in species is very great. The *Spirea*, maple, *Pieris*, cherry, and larch disappear, leaving only willow, juniper, stunted birch, silver fir, white rose, *Aralia*, berberry, currant and more rhododendrons than all these put together; while mushrooms and other English fungi grew amongst the grasses."

Ghoom (near Darjeeling), 7,400 feet, *Sukiapokhri*, 7,000 feet and *Batasia* (below Tonglu), about 6,000 feet are connected by a ridge which varying but slightly in elevation runs west to Sukiapokhri and then turning north along the Nepal border rises steadily to Tonglu. The conditions at these places seem very similar, all being adjacent to heavy forest of magnolia, oak, chestnut, walnut, conifers and bamboos. Below 5,000 to 6,000 feet the ground is cleared for cultivation, most of the spurs running south being planted with tea.

Pashok.—A few specimens were collected here but seeing that Mr. R. S. Lister was so ably carrying on the work of the survey, I pushed on to Ghoom.

Narbong (near Tindaria).—As the guest of Mr. W. K. Webb, I spent a most profitable time on his tea garden, obtaining through his aid a number of specimens new to my collection. The garden shows the usual features associated with tea planting on the Darjeeling Hills, patches of thick jungle alternating with cleared spaces on which the tea bushes flourish. This garden has a range in elevation from 800 to quite 2,500 feet, the lower ground being densely clad with a tropical forest of large deciduous trees and bamboos, conspicuous is the rubber tree (*Ficus elastica*) which grows in some profusion. The subsoil here appeared to be mainly sandstone and clay schists.

Sivok.—Is situated on the Tista where this large river issues in a comparatively narrow channel from the mountains. On reaching the plains it at once becomes a broad and more sluggish stream, its low banks fringed with long grasses and trees of the Terai. The Terai, a long narrow belt of heavy forest runs along the base of the foot hills, between them and the alluvial plains. Near Sivok the forest is principally of Sal and of course the ubiquitous bamboo, the latter being commoner on the foot hills than in the lower forests. Tall grasses and thorn bushes afford excellent cover for

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COLLECTING STATIONS AND ALTITUDES.

Haldibari	150 feet.
Jalpaiguri	200 ,,
Siliguri	200 ,,
Sivok	500 ,,
Pashok	3,500 ,,
Narbong	2,000 ,,
Kurseong	5,000 ,,
Ghoom	7,400 ,,
Darjeeling	7,000 ,,
Singla	4,000 ,,
Sukiapokhri	7,000 ,,
Batasia	6,000 ,,
Gangtok	6,000 ,,
Karponang	9,500 ,,
Changzu	12,600 ,,
Kapup	13,000 ,,
Jalap La	14,400 ,,
Gnatong	12,300 ,,
Sedonchen	6,500 ,,
Rongli	2,700 ,,
Penlong	5,500 ,,
Gangtok	5,500 ,,
Dikchu	2,000 ,,
Ringin	6,000 ,,
Singhik	4,500 ,,
Chuntang	5,350 ,,
Lachen	8,000 ,,
Lachung	8,800 ,,
Thangu	12,800 ,,

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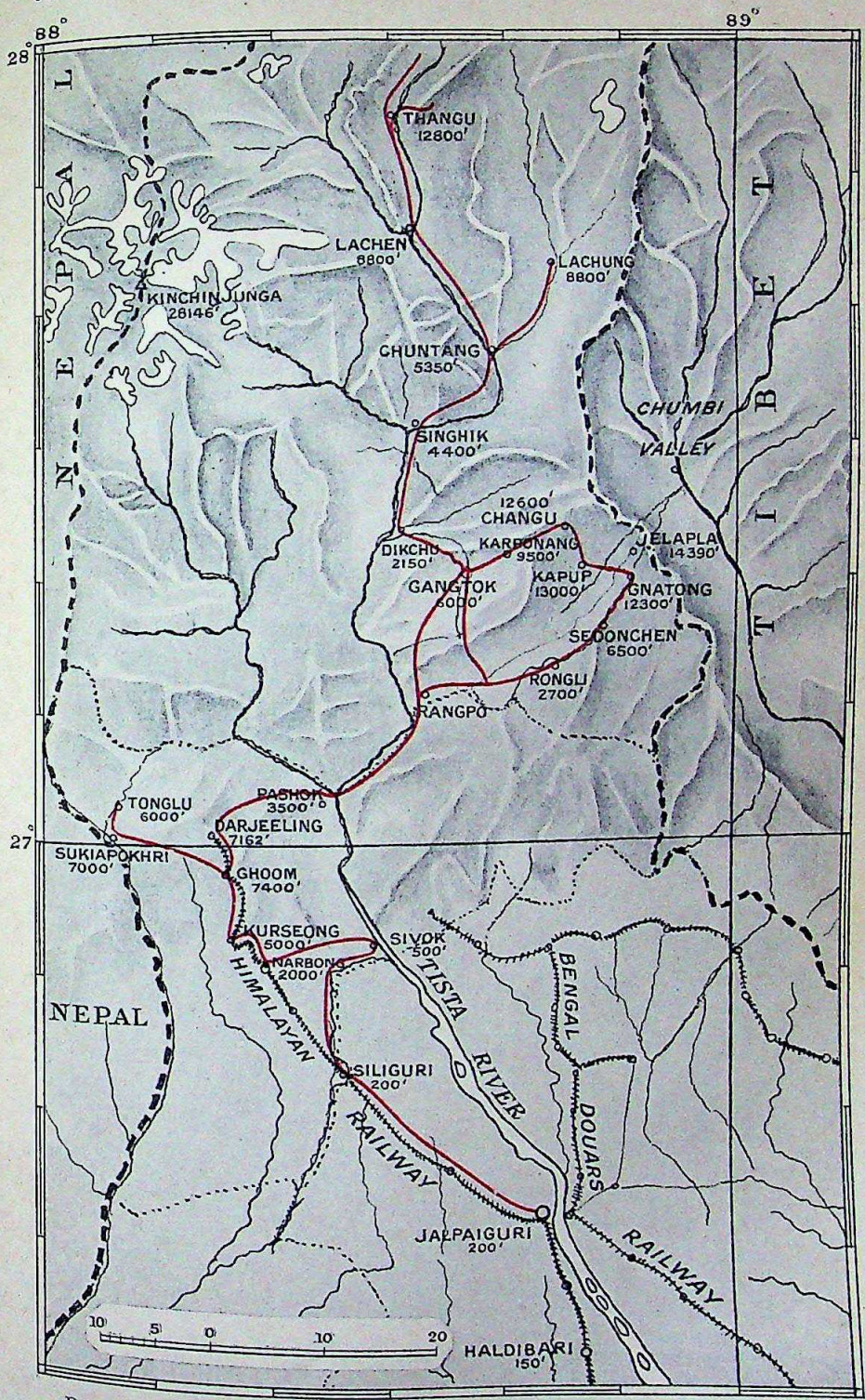

ROUTE MAP OF THE SOCIETY'S MAMMAL SURVEY COLLECTOR (MR. C. A. CRUMP) IN SIKKIM.

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animals and make hunting on foot difficult, as do the long vines which envelop the trunks and hang suspended in great loops from the boughs.

Siliguri.—About 15 miles south of Sivok and about 5 miles outside the Terai. The town is surrounded by a flat alluvial plain, the greater part of which is under rice cultivation. There is no cover of any description in the immediate neighbourhood.

Jalpaiguri.—20 miles to the south-east of Siliguri, near the Tista River. The surroundings are quite flat and generally devoid of trees and bushes. Those parts of the plain which are flooded by the Tista during the rains are clad with a very wiry grass. The villages in the neighbourhood are peculiar, each one being composed of bamboo houses placed in line and flanked by bamboos and palms. Cultivation is principally rice.

Haldibari.—Has the same features as Jalpaiguri from which it is distant about 12 miles. Cultivation jute and rice."

The Collection comprises 1,025 specimens, belonging to 72 species in 53 genera. It contains several forms new to the records of the Survey, *e.g.*, *Pithecus pelops*, *Murina aurata*, and *M. cyclotis*, *Scotomanes ornatus*, *Talpa micrura*, *Chimarrogale himalayica*, *Nectogale elegans*, *Ailurus fulgens*, *Petaurista nobilis*, *Arctomys himalayanus*, *Pseudois nayaur*, and *Moschus moschiferus* but it also comprises two squirrels, two rats and a mouse which, no names being available for them, it has been necessary to describe, *viz.*, *Callosciurus crumpi*, *Dremomys lokriah bhotia*, *Epimys lepcha*, *Epimys eha* and *Mus pahari*. But to my mind a far greater interest attaching to the Collection is due to the peculiar geographical position of the area represented.

It is of course quite obvious that the huge mass of the Himalaya must be a great barrier to the free migration of species north and southwards. But this mechanical obstacle combined with the difference of climate north and south of the range has resulted in a fairly sharp demarcation at or about 28° N. between two distinct faunas, *viz.*, the Palæarctic in the north and the Oriental in the south. Evidences of this in the present Collection is the juxtaposition of such palæarctic genera as *Scotomanes*, *Soriculus*, *Talpa*, *Chimarrogale*, *Nectogale*, *Ailurus*, *Arctomys*, *Microtus*, *Ochotona*, *Pseudois* and *Moschus*, with such characteristically oriental forms as *Pteropus*, *Cynopterus*, *Lyroderma*, *Tupaia*, *Pachyura*, *Viverra*, *Paradoxurus*, *Mungos*, *Ratufa*, *Callosciurus*, *Tomeutes*, *Dremomys*, *Cannomys*, *Muntiacus*, *&c.*

Further, however, the area represented by this Collection (or more exactly a point somewhat west of it in Nepal) appears to be the meeting point of the Indian and Malayan faunas of the Oriental Region, for instance, the squirrels (excluding the giant squirrels and flying squirrels) are represented throughout the western (or

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Indian) sub-region by *Funambulus* alone, while in Sikkim (and Nepal) we have already here recorded *Callosciurus*, *Tomeutes*, *Dremomys*, and *Tamiops*, genera which are represented throughout Burma, W. China, Siam and the Malay Archipelago but of which we found no traces in Kumaon. Again we have now obtained *Cannomys*, which we know from our Burmese Collections extends (with its close relation *Rhizomys*) far eastwards, but was absent from the Kumaon Collection, which on the other hand contains *Nesokia* which extends westward through Persia, to Palestine and Egypt, but not so far as we know, eastwards even into Nepal.

Mr. Crump seems to have had much difficulty in obtaining some of the larger specimens, notably among the Carnivores. He records that in his opinion "the Darjeeling market is largely responsible for the manner in which Sikkim has been denuded of its animals, for an immense trade exists in furs. Panthers, clouded leopard, snow leopard, small cats, civets, otters, foxes, martens, and cat-bears are the chief sufferers, skins of which are imported from Tibet, Bhutan and Nepal now that the local supply has failed."

Mr. Crump notes the following species of which he failed to obtain specimens:—

Felis tigris and *pardus*.—"Scarce in Sikkim, commoner in the foot hills."

Felis nebulosa.—"Has been shot recently; appears to be very rare."

Felis uncia.—"I saw tracks of one at Thangu."—C.A.C.

Felis marmorata.—"I saw a specimen that had been shot near Ghoom."

Felis temmincki.—"A live specimen owned by Mr. T. R. P. Gent, I.F.S., was reared from a kitten and has become exceedingly docile."

Felis affinis.—"I saw a specimen of normal size and colour that had been trapped near Darjeeling. Though easy to trap, I failed to take this cat in Sikkim and have no hesitation in saying that it is rare."

Canis lupus.—Vernacular names: SITUM (Lepcha); PHAO (Bhotia). Wolves are said to be plentiful at Gnatong, Thangu, and above Lachung, when the Tibetans bring their flocks of sheep up for the grazing. I saw one at Thangu in January."

Hystrix.—"Vernacular names: SITIM (Lepcha); DUMSI (Pahari). Porcupines are rare in Sikkim, probably more abundant in the foot hills."

Lepus oiostolus.—"Vernacular names: RIGONG (Lepcha and Bhotia). I heard of hares occurring in summer near the Kongra Lama Pass, above Thangu, in the extreme north of Sikkim. I made a trip in January to the place but without any success."

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Lepus hispidus.—"A hare which may belong to this species is found in the foot hills below Darjeeling and I am informed has been seen near Kalimpong. I saw no hares in the Terai but they probably occur there."

Cuon dukhunnensis.—"A pack did considerable damage among cattle not far from Narbong but did not show up on any of the big beats organised by Mr. W. K. Webb for my benefit.—C.A.C."

Mr. Crump desires to place on record the assistance given him by many officers. He writes: "Much of the success which has attended my efforts to make a representative collection of the mammals of Sikkim and Darjeeling is due to the spontaneous assistance I received from the people on the spot."

H. E. Lord Carmichael, Governor of Bengal, took a personal interest in this Survey and his support paved the way to any success achieved.

I am greatly indebted to the following gentlemen for their generous help:—

C. A. Bell, Esq., Political Agent in Sikkim.
C. Muriel, Esq., Conservator of Forests.
J. R. P. Gent, Assistant Conservator of Forests.
The late J. L. Lister, Esq.
R. S. Lister, Esq.
J. Rankin, Esq.
F. A. Möller, Esq.
L. T. Mackintosh, Esq.
The late G. P. Robertson, Esq.
C. H. Dracott, Esq.
W. K. Webb, Esq.
H. S. Gibson, Esq.

(1) PITHECUS RHESUS, Audeb.

The Bengal Monkey.

(Synonymy in No. 7.)

♀ 1, Narbong.

(*See* also Reports Nos. 14, 15 and 19.)

"Not observed in Native Sikkim. It occurs in the Terai and foot hills below Darjeeling but was not in the neighbourhood of Sivok in March."—C.A.C.

(2) PITHECUS PELOPS, Hodgs.

The Himalayan Macaque.

1840. *Macacus* (*Pithex*) *pelops*, Hodgson, J. A. S. B., IX, p. 1213.
1870. *Macacus problematicus*, Gray, Cat. Monk., &c., B. M., p. 128.
1875. *Macacus rheso-similis*, Sclater, P. Z. S., p. 495.
1888. *Macacus assamensis*, Blanford, Mammalia, No. 4 (*Partim*).

♂ ♀ 1, Rongli; ♂ 1, Chuntang; ♂ 1, Dikchu; ♂ 1, Pashok ♂ 4, ♀ 1, Sukhiapokhri; ♂ 3, Batasia.

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Hodgson's type of *pelops* is in the National Collection and there can be no doubt that these series represent that species. It is equally certain that both *problematicus* and *rheso-similis* are synonyms of *pelops*.

In dealing with the N. Shan States Collection, Miss Ryley recorded the local Macaque as *rhesus*. Later when reporting on the Chindwin Collection I had the advantage of specimens of true *rhesus*, received in the meanwhile from Bengal and Kumaon, with which to compare them and decided that the N. Shan States, Mt. Popa and Chindwin specimens were certainly not *rhesus*.

Of Horsfield's (Macclelland's) *assamensis* the type is not available and the description is most meagre, and until we can obtain topotypes from Assam no certainty is possible. I have therefore recorded this series as *pelops*. If later *assamensis* proves to be identical with *pelops* the Burmese form will require a new name.

This is a much larger animal than *rhesus*. An old male measuring head and body 610 mm., tail 323, hindfoot 180, weight 26 lbs., while a male *rhesus* gives 510, 235, 161 and 16½ lbs. The skulls of the same two specimens give greatest length of 150 and 120 mm. respectively. McClelland describes it as "Bluish grey with dark brownish own the shoulders, beneath light grey," but this series shows that there is a considerable range of colouring. The grey hind limbs and belly are fairly constant but in some cases the tawny colouring of the shoulders is suffused with yellow, while in more there is a black shading of various degrees which may almost amount to a complete substitution for the tawny colour. The greater size and stoutness of the canines as compared with those of *rhesus* is very strongly marked.

"Vernacular names: SAHU (Lepcha); PIO (Bhotia); BANDAR (Pahari).

Found throughout Sikkim and Darjeeling at low elevations, the favourite zone in the cold weather being from 2,000 to 4,000 feet. This monkey congregates in large companies, as a rule frequenting heavy forest. The call is a loud "pio", rather a musical note, repeated frequently. The warning cry is "pio", uttered once by the sentry, who is generally on the look out high up in a tree; the whole band then descends to the ground and moves away in absolute silence concealed by the dense undergrowth.

The flesh is eaten by the Lepchas who regard it as having medicinal properties. Owing to persecution the monkeys are in certain parts of Sikkim exceedingly shy and wary. They are much more fearless on the Nepal border."—C.A.C.

PRESBYTIS SCHISTACEUS, Hodgs.

The Himalayan Langur.

(Synonymy in No. 15.)

♂ 1, ♀ 2, Chuntang; ♀ 1, Lachen.

This species is the largest of the group. Dr. Elliot in his "Review of the Primates" described a species which he called *Pygathrix lania* (*III, p. 93*), It is based on a single rather mutilated specimen which is in the British Museum Collection. The essential character distinguishing it from *schistaceus* is "Hair long, thick, woolly, inclined to gather in masses especially on the back and shoulders." The type locality is the Chumbi Valley. The present specimens are from the western slopes of the mountains bounding the Chumbi Valley on the west and might thus be expected to be more closely related to *lania* than to true *schistaceus* from Nepal and Kumaon, much further westwards. These Sikkim specimens are undoubtedly much better clothed than Kumaon specimens, but in no way to such an extent as to justify their reference to *lania*. Dr. Elliot is probably

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correct in surmising that *lania* is a form "dwelling among the higher mountains, possibly mainly to the north of the Himalayas." In view however of variation shown by our specimens from Kumaon and Sikkim in the length and thickness of the pelage it would seem that *lania* can at most rank as a sub-species of *schistaceus*. I may here record that the pure white underparts of *schistaceus* seem in specimens taken below about 5,000 feet altitude to become tinged with buff.

"Vernacular names: SAHU KABOO (Lepcha); PIOPYAKA (Bhotia).

This Langur is fairly plentiful in the Lachen Valley from about 5,000 to 10,000 feet, apparently it does not go below Chuntang. I found it always shy and wary, and confined entirely to the heavy forests. The bands as a rule were rather small. I do not remember to have heard the call note on any occasion, even when fired at the Langurs were silent.

A few more observed at Sedonchen but no specimen was obtained. My Shikari states that he saw a single Langur (? *entellus*, R. C. W.) in the Terai at Sivok".—C.A.C.

(4) PTEROPUS GIGANTEUS, Bruenn.

The Common Flying Fox.

(Synonymy in No. 2.)

♂ 1, Siliguri; ♂ 7, ♀ 4, Jalpaiguri.

(*See* also Reports Nos. 3, 4, 5, 7, 8, 9, 10, 12, 13, 15, 18, 19 and 22.)

"At Jalpaiguri I found a large colony roosting among tall bamboos. Though the surrounding plain is treeless there are numbers of large trees in the town close by."—C. A. C.

(5) CYNOPTERUS SPHINX SPHINX, Vahl.

The Southern Short-nosed Fruit Bat.

(Synonymy in No. 6.)

1 juv.; Singla.

(*See* also Reports Nos. 9, 11, 13, 14, 15, 18, 19 and 20.)

The specimen is too young for certain determination but I record it as true *sphinx* basing on the locality where it was taken. The sub-species *gangeticus* is only found much further west.

(6) RHINOLOPHUS PERNIGER, Hodgs.

The Himalayan Horseshoe Bat.

(Synonymy in No. 14.)

1 (not sexed); Singla.

The three species *luctus*, *perniger* and *beddomei* are closely related but the present is the largest and the last mentioned is the smallest. Blanford's English name will no longer serve and I propose to call them the Malayan, Himalayan and S. Indian Horseshoe Bat respectively.

(7) RHINOLOPHUS TRAGATUS, Hodgs.

Hodgson's Horseshoe Bat.

1835. *Rhinolophus tragatus*, Hodgson, J. A. S. B. IV., p. 699.
1891. *Rhinolophus tragatus*, Blanford, Mammalia, No. 157.

♂ 1, Rongli.

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Though one of the Horseshoe Bats allied to the European *ferrum equinum* it is very much smaller than the smallest of the *luctus* group. It is characterised by the presence of three vertical grooves on the lower lip, *ferrum equinum* having only one.

(8) HIPPOSIDEROS FULVUS, Gray.

The Bi-coloured Leaf-nosed Bat.

(Synonymy in No. 3.)

♀1, Rongli ; in al. 6, Pashok ; in al. 1, in Narbong.

(*See* also Reports Nos. 5, 6, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, 20 and 22.)

(9) LYRODERMA LYRA, Geoff.

The Indian Vampire Bat.

(Synonymy in No. 1.)

♂10, ♀16, in al. 5, Siliguri ; ♂4, ♀2, in al. 2, Jalpaiguri.

(*See* also Reports Nos. 4, 5, 6, 7, 8, 9, 12, 15, 14, 19 and 22.)

"Very plentiful at Siliguri and Jalpaiguri."—C.A.C.

(10) PIPISTRELLUS COROMANDRA, Gray.

The Coromandel Pipistrel.

(Synonymy in No. 5.)

♂2, Rongli; ♂1, ♀1, Pelong (Gangtok); ♂1, ♀1, Siliguri; ♂6, ♀12, Jalpaiguri ; ♂3, ♀6, Haldibari.

(*See* also Reports Nos. 9, 11, 13, 14, 15, 19 and 23.)

(11) PIPISTRELLUS MIMUS, Wr.

The Southern Dwarf Pipistrel.

(Synonymy in No. 1.)

♂ 2, ♀ 4, Jalpaiguri.

(*See* also Reports Nos. 2, 3, 5, 6, 7, 8, 9, 10, 12, 13, 15, 18, 19 and 20.)

(12) TYLONYCTERIS MEYERI, Pet.

The Pigmy Club-footed Bat.

1872. *Tylonycteris meyeri*, Peters, M.B., Akad. Berl., p. 705.
1891. *Vesperugo pachypus*, Blanford, Mammalia, No. 180.
♂ 1, Sivok.

This animal is distinguishable from *pachypus* by its smaller size.

(13) SCOTOPHILUS KUHLI, Leach.

The Common Yellow Bat.

(Synonymy in No. 1.)

♂ 7, ♀ 9. Jalpaiguri.

(*See* also Reports Nos. 3, 5, 6, 7, 9, 12, 14, 15, 16, 19 and 20.)

"Membranes brown, limbs and metacarpels much paler. Claws dirty white. Mammæ, sometimes 4, one pair being rudimentary."—C. A. C.

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(14) SCOTOPHILUS WROUGHTONI, Thos.

Wroughton's Bat.

(Synonymy in No. 1.)

♂ 2, Jalpaiguri.

(*See* also Reports Nos. 5, 6, 7, 9, 10, 11, 12, 15, 16, 17, 18 and 19.)

"Membranes, ears and limbs, almost black. Claws bright yellow."—C.A.C.

(15) SCOTOMANES ORNATUS, Blyth.

The Harlequin Bat.

1852. *Nycticejus ornatus*, Blyth, J. A. S. B., XX, 159.
1855. *Nycticejus nivicolus*, Horsfield, A. M. N. H., XVI, p. 104.
1891. *Nycticejus ornatus*, Blanford, Mammalia, No. 197.
1 (not sexed, skull in), Singla; ♂ 2, ♀ 15, Sivok.

The type locality of *ornatus* is Cherrapunji in Assam, while that of *nivicolus* is "Sikkim, Himalaya, Northern portion, near the snows" (teste Hodgson's drawings). Horsfield states of *nivicolus* that it is altogether destitute of the white spots and bands in the description of the *N. ornatus*," but in Hodgson's drawings these are plainly shown, though he points out that they are less conspicuous in the female. Under the circumstances I place *nivicolus* as a synonym of *ornatus* with full confidence.

"Flies high and fairly fast, emerging just before dark. The high pitched twittering note is altered constantly during the flight. Limbs, digits, whole of interfemoral membrane and the nearly naked muzzle tawny red. Wing membranes sheeny black. Feet dark brown."—C. A. C.

(16) MYOTIS CALIGINOSUS, Tomes.

Tomes' Whiskered Bat.

1859. *Vespertilio caliginosus*, Tomes, P. Z. S., p. 73.
1871. *Vespertilio blanfordi*, Dobson, P. A. S. B., p. 214.
1871. *Vespertilio nipalensis*, Dobson, P. A. S. B., p. 214.
1891. *Vespertilio mystacinus*, Blanford, Mammalia, No. 211.
♂ 2. Sedonchen; ♂ 1, Lachen.

Mr. Thomas dealt with this genus in 'Results' (No. XXIII, p. 607) where he pointed out that all the names quoted above belonged to the *mystacinus* and not to the *muricola* group. He has kindly examined the present series and given me the following note:—"The canines of these specimens agree precisely in size with those of the type of *caliginosus*, are larger than those of *siligorensis* and smaller than those of *blanfordi*. As already shown (*l.c.*), these species form a closely allied group, and I am still doubtful how far the development of the canines is a valid specific character, in view of the mutual resemblance of these bats in all other respects."

(17) MURINA AURATA, M. Edw.

The Tibetan Tube-nosed Bat.

1872. *Murina aurata*, A. Milne-Edwards, Mamm., Tib., p. 250.
♂ 2, Sedonchen.

Blanford refers to this species at page 328, but when he wrote it had never been taken within Indian limits. The type locality is Eastern Thibet.

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(18) MURINA CYCLOTIS, Dobs.

The round-eared Tube-nosed Bat.

1872. *Murina cyclotis*, Dobson, P. A. S. B., p. 210.
1891. *Harpyiocephalus cyclotis*, Blanford, Mammalia, No. 201.
Not sexed 1, Singla.

(19) TAPHOZOUS KACHHENSIS, Dobs.

The Cutch Sheath-tailed Bat.

(Synonymy in No. 1.)

♂8, ♀2, Sivok.

(*See* also Reports Nos. 3, 8, 9, 10, 12 and 19.)

The flight is much more rapid and direct than in *S. ornatus*."—C.A.C.

(20) TUPAIA BELANGERI CHINENSIS, And.

The Assam Tree Shrew.

(Synonymy in No. 14.)

♂1, Rongli; ♂1, Goom; ♂2, ♀2, Narbong; ♀1, 1 (not sexed) Sivok.

The specimens in the N. Shan States Collection were recorded by Miss Ryley as *chinensis*, but later when Mr. Thomas made the sub-species *siccata* on a specimen from the Lower Chindwin (A. M. N. H., XIII, p. 244, 1914), it was clear that the Shan States specimens should rank rather as *siccata* than as *chinensis*. This is therefore the first time that we have received real *chinensis*. Blanford ranked both *belangeri* and *chinensis* as synonyms of *ferruginea*, but this latter species has only two pairs of mammæ, and it does not I believe occur within our area. I had to supply an English name for this species, so, although the type locality is Kakhyen Hills, as it ranges westward as far as Sikkim, I have adopted Assam Tree Shrew as suitable.

"Vernacular name: TING-ZING (Lepcha).

At low elevation in Sikkim. May be more common than is supposed as it is exceedingly shy and unobtrusive. When living in the neighbourhood of houses it will sometimes become bold and enter verandahs and rooms to pick up scraps."—C.A.C.

(21) TALPA MICRURA, Hodgs.

The Short-tailed Mole.

1841. *Talpa micrura*, Hodgson, J. A. S. B., X, p. 910.
1843. *Talpa cryptura*, Blyth, J. A. S. B., XII, p. 177.
1888. *Talpa micrura*, Blanford, Mammalia, No. 112.
1 (head only) Dikchu; 1 (not sexed) Darjeeling; 1 (not sexed) Batasia; 1, Sivok.

This animal closely resembles the European mole, but is recognisable by its extremely short, almost naked tail.

"Vernacular names: PARIAM (Lepcha); PIZI-KANGKIAM (Bhotia); UTANI-MOOSA (Pahari).

In the Darjeeling Hills Moles are found from the plains up to at least 7,500 feet. They are not much in evidence during the cold weather, but I am told they are frequently seen burrowing across pathways during the monsoon. As a rule mole-hills are not thrown up and a bush or a root of a tree often form the base from which a mole works. At Sivok in soft sandy soil the runs sometimes extended for forty or fifty yards. The hands of the mole are dried and used as charms by the hill people."—C.A.C.

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(22) SORICULUS NIGRESCENS, Gray.

The Sikkim brown-toothed Shrew.

(Synonymy in No. 15.)

♂ 3, ♀ 5, Sedonchen; ♂ 1, Gangtok; ♂ 9, ♀ 11, Chuntang; ♂ 12, ♀ 9, Lachen; ♂ 8, ♂ 10, Ghoom; ♂ 1, ♀ 2, Sukiapokhri.

"Vernacular Names: TING-ZING (Lepcha); TING-JEE CHUCHUNDRA (Pahari). These names are used for all shrews.

Very common, particularly at about 5,000 to 9,000 feet. Usually found in forest, but comes into houses."—C.A.C.

(23) SORICULUS CAUDATUS, Horsf.

Hodgson's brown-toothed Shrew.

(Synonymy in No. 15.)

♀ 1, Sedonchen; ♂ 3, ♀ 3, Chuntang; ♂ 23, ♀ 27, Lachen; ♂ 2, ♀ 2, Ghoom.

"Found in forest, under walls and near houses"—C. A. C.

(24) SORICULUS MACRURUS, Blanf.

The Long-tailed Shrew.

1863. *Sorex macrurus*, Hodgson, Cat., Mamm., Nep. p. 9 (no description).
1888. *Soriculus macrurus*, Blanford, Mammalia, No. 116.

♀ 1, Chuntang; ♂ 1, Lachen.

Hodgson's *macrurus* is a nomen nudum, and though I have made a considerable search I have been unable to find any reference to this animal earlier than Blanford's Mammalia, which must consequently stand as the authority for the name.

This is the smallest of the three species obtained by Mr. Crump and is characterised by its long tail which is one and-a-half times as long as the head and body combined.

"Trapped on steep rocky banks. Mammæ 6, the anterior pair much further forward than in most shrews."—C.A.C.

(25) PACHYURA sp.

Musk Shrew.

1 (not sexed), skull in, Darjeeling; ♀ 1 (not sexed), Gnatong; ♂ 4, ♀ 1, Rongli; ♀ 1, Dikchu; ♂ 4, ♀ 1, Ghoom; ♂ 2, ♀ 1, Narbong; ♂ 3, Sivok; ♀ 2, Siliguri.

(*See* also Reports Nos. 3, 4, 5, 6, 7, 9, 10, 11, 12, 13 15, 16, 17, 18, 19 and 22.)

"Not common in Sikkim."—C.A.C.

(26) PACHYURA HODGSONI, Jerd.

The Himalayan Pigmy Shrew.

(Synonymy in No. 15.)

♂ 1, Narbong.

(*See* also Reports Nos. 16 and 19.)

(27) CROCIDURA KINGIANA, And.

King's Shrew.

(Synonymy in No. 15).

♂ 2, ♀ 2, Narbong.

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(28) CHIMARROGALE HIMALAYICA, Gray.

The Himalayan Water-Shrew.

1842. *Crossopus himalayicus*, Gray, A. M. N., X, p. 261.
1888. *Chimarrogale himalayica*, Blanford, Mammalia, No. 131.
♂ Rongli.

Externally this animal does not differ materially from a *Pachyura* but the feet are extraordinarily broad and the tail is bicoloured dark above and white below.

"Vernacular names: UNG-LAGNIYU (Lepcha); CHUPICHI (Bhotia).

Said to be frequently seen in streams at low elevations during hot weather but not so often in winter."—C.A.C.

(29) NECTOGALE SIKHIMENSIS, de Wint.

The Finger-tailed Water Shrew.

1888. *Nectogale elegans*, Blanford. Mammalia No. 132.
♂ 1, 3 (not sexed) Chuntang. (*Nec* Milne-Edwards).
1899. *Nectogale sikhimensis*, de Winton, P. Z. S., 1899, p. 573.

This animal is highly differentiated for its aquatic life, very much more so than *Chimarrogale*. The feet (especially the hind feet) are not only large and broad but are fringed with modified white hairs to increase their resistance to the water; the tail is also broadly fringed with white hairs throughout its length.

"Vernacular names: UNG-CLOH (Lepcha); CHUPICHI (Bhotia).

"This charming little mammal is wonderfully adapted for an aquatic life and is as thoroughly at home in the water as a fish. It displays wonderful agility when swimming and runs easily over smooth rocks that are submerged in a rapid torrent. Its powers of sight seem to be poor, for natives told me it is easily caught by hand. The head and body are much depressed, being greater in breadth than in depth. The terminal portion of the tail is greatly compressed."—C.A.C.

(30) FELIS BENGALENSIS, Kerr.

The Leopard Cat.

1 (not sexed, skull in), Chuntang; 2 (not sexed, no skulls) Lachung; 1 (not sexed, no skull). Pashok.
1 (Tanned skin, skull in, not sexed). Locality uncertain.

(*See* also Reports Nos. 11, 14, 15, 16 and 20.)

"Vernacular names: SIRICK (Lepcha); PYAZIK (Bhotia)."

"Is probably found sparingly throughout Sikkim and Darjeeling at moderate elevations."—C.A.C.

(31) VIVERRA ZIBETHA, L.

The large Indian Civet.

♀ 2 (one skull) 1, (juv. not sexed, no skull), Rongli; 1 (not sexed, no skull), Gantok; ♀ 1 (imm.) Batasia; Tonglu; ♂ 4, ♀ 1, Narbong; ♂ 1, ♀ 2, Sivok.

(*See* also Report No. 20.)

The synonymy of *zibetha* was given in Report 14 (N. Shan States) but later (Vol. XXIV, p. 64.) I was obliged to separate the Burmese form as a sub-species under the name *pruinosa*.

Linnæus gives the type locality as "Habitat in Indieis." The present series may be accepted as true *zibetha*.

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"Vernacular names. SAPHIONG (Lepcha); NINGALICHITUA (Pahari).

In Sikkim and Darjeeling this seems to be the most common of the Carnivores and is a great thief among the village chickens. It is found from the base of the foot hills up to about 7,000 feet or more, being most abundant at an elevation of about 3,000 feet.

It is purely nocturnal and though easily lured to the trap by a piece of meat, appears to be an equally ardent vegetarian, feeding a good deal on berries and having a partiality for Cardamons."—C. A. C.

VIVERRICULA MALACCENSIS, Gmel.

The small Indian Civet.

(Synonymy in No. 3.)

♀ 1. Haldibari.

(*See* also Reports Nos. 5, 7, 10, 11, 12, 13, 15, 16, 18, 19, 20 and 22).

"In Sikkim I could gain no reliable information about this species."—C. A. C.

(33) PRIONODON PARDICOLOR, Hodgs.

The Indian Tiger Civet.

1842. *Prionodon pardicolor*, Hodgson, Calc. Journ. N. H., II, p. 57.
1888. *Prionodon pardicolor*, Blanford, Mammalia, No. 49.

1 (no skull) Locality uncertain; 1 (not sexed, no skull) Chuntang; 1 (not sexed, no skull), Singhik; 3 (not sexed, no skull), Dikchu.

"Vernacular names, SILU (Lepcha); ZIK-CHUN (Bhotia).

Tista and Lachen Valleys: 2,000 to 5,000 feet. Probably a vegetarian as I could not attract it with a flesh bait. As far as I could learn it is nocturnal."—C. A. C.

(34) PARADOXURUS HERMAPHRODITUS, Pall.

The Malayan Palm Civet.

(Synonymy in No. 16.)

♂ 1, Narbong; ♂ 2, ♀ 1, Sivok; ♂ 1, Haldibari.

(*See* also Reports Nos. 17 and 20.)

"At Sivok I saw a pair in a tree, one lay flat along a branch, the other being coiled up amongst the foliage. After the former had been shot the second moved about in the tree in a very sluggish manner. Both gave out an intensely fœtid odour. When they were being carried to camp, through the forest, all the jungle fowl in the vicinity became very excited and with much cackling flew up into trees and bushes."—C. A. C.

(35) PAGUMA GRAYI, Benn.

The Himalayan Palm Civet.

(Synonymy in No. 15.)

♂ 2, Narbong; 1 (not sexed, skull in). No locality.

"Two were shot out of a party of four which were on the ground, turning over dead leaves in search of food."—C. A. C.

(36) MUNGOS MUNGO MUNGO, Gmel.

The common Benga Mongoose.

(Synonymy in No. 1).

♂ 2, ♀ 6, Haldibari; ♀ 2, Jalpaiguri.

(*See* also Reports Nos. 19 and 21).

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I recently distributed the species among a number of sub-species (Vol. XXIV p. 50). As was to be expected these are *mungo mungo* and quite agree with the specimens of that race in the National Collection.

(37) MUNGOS URVA, Hodgs.

The crab-eating Mongoose.

1836. *Gulo urva*, Hodgson, J. A. S. B., V., p. 238.
1837. *Urva cancrivora*, Hodgson, J. A. S. B., VI., p. 561.
1888. *Herpestes urva*, Blanford, Mammalia, No. 65.
1 (not sexed) Pashok; ♀ 1 (no skull), Kurseong.

"Mr. Lister states that this mongoose came repeatedly to a tank which was stocked with gold-fish. It took many of the fish and it must have dived from the tank side to procure them. I kept a sharp look out in the low valleys but did not see this species."—C. A. C.

(38) CANIS INDICUS, Hodgs.

The Common Indian Jackal.

(Synonymy in No. 1.)

♂ 3, ♀ 3, Rongli; ♂ 1, Dikchu; ♂ 1, Sukiapokhri; ♀ 1, Narbong; ♂ 1, Sivok.

(*See* also all previous Reports except Nos. 2, 8, 13 and 17.)

"Vernacular names: SYOL (Lepcha); NAO-HAM (Bhotia); SYAL (Pahari).
In Sikkim the jackal is not common above 3,000 feet, except near Gangtok.
In Darjeeling District it is found as high as 7,000 feet."—C. A. C.

(39) VULPES BENGALENSIS, Shaw.

The Indian Fox.

(Synonymy in No. 1.)

♂ 1, ♀ 2, Haldibari.

(*See* also Reports Nos. 3, 5, 7, 10, 12, 15 and 19.)

"Does not occur in the hills. I could not find it in the Terai. Common at Jalpaiguri and Haldibari."—C. A. C.

(40) VULPES MONTANA, Pears.

The Hill Fox.

(Synonymy in No. 15.)

♂ 1, Kapup; ♀ 1, Thangu.

A handsome long haired Fox, allied to the common Fox of Europe.
"Vernacular name: SOHAH (Lepcha).
Exceedingly rare. Only found above 10,000 feet in north and east of Sikkim."—C. A. C.

(41) MUSTELA SUBHEMACHALANA, Hodgs.

The Himalayan Weasel.

1837. *Mustela (Putorius) subhemachalanus*, Hodgson, J. A. S. B., VI., p. 563.
1842. *Mustela humeralis*, Blyth, J. A. S. B., XI., p. 90.
1843. *Mustela horsfieldi*, Gray, A. M. N. H., XI., p. 118.
1888. *Putorius subhemachalanus*, Blanford, Mammalia, No. 82.
♂ 2, Lachen; 1 (not sexed, skull in) Lachung Valley.

"Vernacular name: SINGKING (Lepcha)."—C. A. C.

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(42) MARTES FLAVIGULA, Bodd.

The Northern Indian Marten.

(Synonymy in No. 15.)

♂1, Chuntang.

(*See* also Report No. 20.)

"Vernacular names: SAKKU (Lepcha); SHINGSAM (Bhotia); MALSAMPRA (Pahari).

Appears to be rare in Sikkim, more plentiful near Darjeeling. Mr. Gent once saw a pair running down a Barking Deer fawn."—C. A. C.

(43) LUTRA LUTRA, L.

The Common Otter.

(Synonymy in No. 11.)

1 (not sexed, no skull), Chuntang; ♂1, Dikchu.
1 (not sexed, no skull), Darjeeling.

(*See* also Reports Nos. 15 and 18.)

(44) AILURUS FULGENS, F., Cuv.

The Red Cat-Bear.

1825. *Ailurus fulgens*, F. Cuvier, Hist. Nat. Mamm. pl. 203.
1847. *Ailurus ochraceus*, Hodgs., J. A. S. B., XVI., p. 1118.
1888. *Ælurus fulgens*, Blanford, Mammalia, No. 96.
♂3, ♀2, Chuntang; ♂1, Lachen; ♂1, ♀2, Lachung; 1 (not sexed, no skull), Ringin.

"Vernacular names: SUNAM (Lepcha); OAKDONGA (Bhotia).

The Cat-Bear is comparatively plentiful in Sikkim at high elevations. It is nocturnal, generally spending the day asleep amongst the topmost boughs of pine trees. It is sluggish in its movements, and is often run down and killed with sticks, by the Natives. One which was sitting in a tree allowed a noose to be placed over its head and when pulled down landed on the head of its would-be captor and in the ensuing excitement made good its escape."

(45) PETAURISTA NOBILIS, Gray.

The Himalayan Flying Squirrel.

1804. *Pteromys nobilis*, Gray, A. M. N. H., X., p. 263.
1844. *Pteromys chrysothrix*, Hodgson, J. A. S. B., XIII., p. 67.
1891. *Pteromys magnificus*, Blanford, Mammalia, No. 229 (*Partim*).
♀1, Sedonchen; ♀1, Batasia; 1 (not sexed, skull in), Darjeeling.

In my paper on the Giant Flying Squirrels, (Vol. XX., p. 1018 and *seq.*) I arrived at the conclusion that *P. inornatus* a Kashmir form was quite distinct from *albiventer*, Gray, from Nepal, and that *albiventer*, Gray, and *magnificus*, Hodgs, were one animal, which however was quite distinct from *nobilis*, Gray (*chrysothrix*, Hodgs). Gray and Hodgson described this animal simultaneously but owing to delay in publication Gray's name appeared two years earlier than Hodgson's and must stand for the species.

"Vernacular names: BYOM (Lepcha); PYAMPIO (Bhotia); RAJ-PANKI (Pahari).

This handsome flying squirrel appears to have a local distribution in Sikkim. I observed several near the Chumbi border at Sedonchen but the

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thick mists floating up the valley every evening made shooting very difficult. This flying squirrel is more plentiful in the Nepal border. In my opinion it is not found below 6,000 feet; the extent of its upper range is probably governed entirely by the food supply.

I devoted much time to the search but failed to locate this species at Gangtok or in the Lachen Valley.

By moonlight I saw a number near Sukiapokhri but they seemed to be unusually shy and I rarely heard them call.

By means of small fires in the jungle I attracted them occasionally to the neighbouring trees but they generally remained so quiet among the thick foliage that I was unable to find them. I believe flying squirrels could be collected with the aid of an acetylene lamp."—C. A. C.

(46) PTEROMYS ALBONIGER.

The Parti-coloured Flying Squirrel.

(Synonymy in No. 20.)

♂ 2, 1 (not sexed, no skull), Chuntang; 3 (not sexed, no skulls), Singhik; ♂ 1 (skull in), Pashok.

"Vernacular names: KIM (Lepcha); PYAMPIO (Bhotia); RAJ-PUNKI (Pahari).

About 5,000 feet is probably the upper limit of the range of this flying squirrel. It moves higher or lower in the valleys according to the supply of food, for in places it is said to be plentiful only at certain seasons. The natives assert that it builds a large nest of twigs and grass placed high up in the fork of a tree. It is more likely that the nests referred to are those of *Ratufa*, as both species are found on the same ground, and it is likely that the flying squirrels take possession of discarded nests."—C. A. C.

(47) RATUFA GIGANTEA, McCl.

The Assam Giant Squirrel.

(Synonymy in No. 14.)

♀ 1, Rongli; ♂ 1, ♀ 2, Dikchu; ♂ 3, Pashok; ♂ 1, ♀ 1, Sukiapokhri; ♂ 2, ♀ 1, Norbong; ♂ 2, ♀ 1, Sivok.

"Vernacular names: AHARYNA (Bhotia); MAL SAMPRA (Pahari).

This squirrel is usually found in pairs and is not gregarious. It is more plentiful between the Terai and the low valleys up to about 3,000 feet, being particularly partial to the dense tall jungle bordering rivers.

It has the loud clacking note common to most squirrels but calls only on rare occasions. It is an extremely active climber and as a rule is wary; making off and hiding in the thick foliage immediately danger is feared."—C. A. C.

(48) CALLOSCIURUS CRUMPI, Wr.

Crump's Squirrel.

1916. *Callosciurus crumpi*, Wroughton, Journ. B.N.H.S., Vol. XXIV., p. 424.

♂ 4, ♀ 4, Sedonchen.

This species does not markedly differ from the forms of the *erythræus* group until the under surface is exposed when the fine grizzling not markedly differing from the flanks is a great contrast to the various shades of red in all the members of that group. There is an area about the inguinal region where the normal colouring is indicated. It is not surprising that a squirrel from such a high elevation should show considerable variation from its allies of the low-lands.

"Vernacular names: KULLI (Lepcha); ZHAM (Bhotia); LOTHORKI (Pahari).

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Found in heavy forest, singly or in pairs. When alarmed it usually makes for ground, it was also observed to come down in the evening, so probably it breeds in holes among the roots of trees. The call is a deep toned clack rapidly repeated. I saw this squirrel only at Sedonchen."—C.A.C.

(49) TOMEUTES LOKROIDES, Hodgs.

The Hoary-bellied Himalayan Squirrel.

1836. *Sciurus lokroides*, Hodgson, J.A.S.B.,v., p. 232.
1842. *Sciurus assamensis*, McClelland. (No description.)
1854. *Sciurus blythii*, Tyler, A.M.N.H., 2, XIV, p. 172.
1891. *Sciurus locroides*, Blanford, Mammalia, No. 251.

♂ 3, ♀ 1, Pashok ; ♂ 1, Kurseong ; ♂ 2, Narbong : ♂ 6, ♀ 5, Sivok.

(50) TOMEUTES SIMILIS, Gray.

The Red-flanked Himalayan Squirrel.

1867. *Macroxus similis*, Gray, A.M.N.H, 3, XX., p. 274.
1891. *Sciurus locroides*, Blanford, Mammalia, No. 251 (*partim*).

♂ 4, ♀ 8, Rongli ; 1, 5, Gangtok ; 3, Dikchu.

Mr. Crump's note does not distinguish between the two species.

"Found at low elevation. At Rongli it was very partial to oranges, doing much damage to the crop. The "dray" is a collection of grass and sticks, placed high up in a tree. This squirrel is found in heavy forest, and near villages and may often be seen on the ground searching for food. Considering the size of the animal its call is sometimes very loud."—C.A.C.

(51) FUNAMBULUS PENNANTI, Wr.

The Common Five-striped Squirrel.

(Synonymy in No. 1.)

♂ 1, Haldibari.

(*See* also Reports Nos. 2, 3, 4, 5, 7, 10, 12, 15, 19, 21 and 22.)

This is apparently a straggler but it is interesting to find it is *pennanti* which so far has been represented in Northern India as far south as 24° (at any rate in the east), and not *palmarum*, which would seem to be the more likely, as Calcutta, which is well in *palmarum* country is most closely connected with Sikkim. I am therefore doubtful about its being an 'introduced' specimen as conjectured by Mr. Crump.

"Not found in Sikkim nor even near the foot hills. Probably was introduced at Haldibari where I saw it only in the town and not in the surrounding villages."—C.A.C.

(52) DREMOMYS LOKRIAH LOKRIAH, Hodgs.

The Long-snouted Nepal Squirrel.

1836. *Sciurus lokriah*, Hodgson, J.A.S.B., V, p. 232.
1891. *Sciurus locria*, Blanford, Mammalia, No. 243.

♂ 2, ♀ 2, Lachen ; ♀ 1, Ringin ; ♂ 1, Ghoom ; ♂ 3, ♀ 1, Sukiapokhri, ♀ 1, Batasia.

(53) DREMOMYS LOKRIAH BHOTIA, Wr.

The Long-snouted Bhootan Squirrel.

1916. *Dremomys lokriah bhotia*, Wroughton, Journ. B.M.H.S., Vol. XXIV, p. 425.

♂ 1, Karpomang; ♂ 3, ♀ 3, Sedonchen; ♀ 1, Gangtok ;
♂ 2, ♀ 2, 1 (not sexed, skull in), Chuntang.

There are clearly two races of *lokriah* in this series of *Dremomys*. The one series closely agreeing with the co-types of *lokriah* from Nepal was mostly

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obtained near the Nepal border, as was to be expected. The others were all taken on the east bank of the Tista River, *i.e.*, close to the Bhutan border. I have described this latter race elsewhere in this Journal (l. c.) When series of the two races are compared the sombre colouring of *bhotia* is most noticeable. Among the series of *bhotia* however is one individual which is in no way distinguishable from true *lokriah*. The presence of aberrant individuals is not by any means an unusual thing when series of two races with continuous distribution are made. In this case, however, the two series are so even among themselves and this aberrant specimen is so exactly like the other series that I am almost led to conjecture that there has been some error in the labelling. Mr. Crump's note of course refers to both forms.

"Common in all the forests from 5,000 to 9,000 feet. Lives in holes in trees, generally low down and is frequently seen on the ground, feeding on fallen nuts and berries. As a rule it is silent but on occasion utters a loud cockling note. When approached it hides itself by lying flat along a branch, and does not attempt to leave the tree unless really frightened."—C.A.C.

(54) TAMIOPS MACCLELLANDI, Horsf.

The Striped Himalayan Squirrel.

(Synonymy in No. 20.)

♂ 8, ♀ 7, Sedonchen; ♂ 3, ♀ 1, Gangtok; ♂ 1, ♀ 1, Penlong; ♂ 4, ♀ 11, Chungtang; ♀ 1, Ringin; ♀ 2, Batasia.

"Vernacular name: TANGDING-KALLI (Lepcha).

This squirrel is found in most of the forests above 5,000 feet. It is common but owing to its power of concealment is generally not very easy to find. It is very nimble and appears to glide rather than walk along the boughs and slender twigs. I observed it in pairs and sometimes in small parties often sharing the tree with *D. lokriah*. It seldom comes to the ground. The call is a quickly repeated "chick" much harsher in tone than that of *F. pennanti*".—C.A.C.

(55) MARMOTA HIMALAYANA, Hodgs.

The Tibet Marmot.

1841. *Arctomys himalayanus*, Hodgson, J.A.S.B., X, p. 777.
1891. *Arctomys himalayanus*, Blanford, Mammalia, No. 259.

Four mutilated flat skins, without skulls or known locality.

These skins are of no value for diagnostic purposes. I use the name *himalayana* as that of the commoner species. Hodgson decided later that the real Sikkim Marmot is a smaller animal and that *himalayana* is confined to Tibet. It is disappointing that Mr. Crump was prevented by the season from solving this problem.

Vernacular name: CHUPIT (Bhotia).*

Marmots are said to be common at Kapup in summer. I could not find any in October. Very common above Thangu but was of course hibernating in January and the ground was frozen too hard to permit of digging out."—C.A.C.

(56) GUNOMYS BENGALENSIS, Gray and Hardw.

The Bengal Mole Rat.

(Synonymy in No. 19.)

♀ 1, Pashok; ♀ 1 (not sexed), 2, Ghoom; ♂ 1, Narbong.

(*See* also Report No. 20.)

One of the specimens from Ghoom is a complete melano.

*'CHUBIG' (C.H. Dracott). Sikkim name 'KAJAPHEGOO' (meaning 'Hermit')—C.H.D.

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(57) EPIMYS RUFESCENS, Gray.

The Common Indian Rat.

(Synonymy in No. 1.)

Variety with white underparts.

♂3, ♀2, Sedonchen; ♂8, ♀9, Rongli; ♀2, Singhik; ♂3, ♀2, Gangtok; ♂4, Dikchu; ♂1, ♀1, Ringin; ♂1, ♀1, Pashok; ♂1, ♀3, Batasia; ♂7, ♀7, Narbong; ♂2, Jalpaiguri.

I am convinced that this series comprises several local forms of the '*rattus*' group and have tried to separate one or more of them, but it is a result to obtain which, is much more difficult and complicated than it seems to be at first sight. I have relinquished the idea for the present but the curious parallelism between the Kumaon series and the present one have strengthened my belief that when the whole group is worked it will be found that these Himalayan '*rattus*' represent several quasi-stable forms.

(58) EPIMYS NITIDUS, Hodgs.

Hodgson's grey-bellied Rat.

(Synonymy in No. 15.)

♂6, ♀3, Gangtok; ♂1, Gnatong; ♂1, Rongli; ♂1, Chuntang, ♀1, Dikchu; ♂10, ♀9, Ghoom; ♂5, ♀2, Sukiapokhri; ♂2; ♀1, Batasia.

"Vernacular names for all Rats and Mice: CLOKH (Lepcha); PICHI (Bhotia); MOOSA (Pahari)."—C.A.C.

(59) EPIMYS VICEREX, Bonh.

The North Asian Rat.

(Synonymy in No. 15.)

♂2, ♀6 (not sexed 2), Chuntang; ♀2, Ghoom; ♀1, Batasia.

I use this name for the series with some hesitation. The characteristic white belly and bicoloured tail are much less marked than in true *vicerex* and even than in our Kumaon specimens.

(60) EPIMYS FULVESCENS, Gray.

The Chestnut Rat.

(Synonymy in No. 15.)

♂11, ♀10 (one skull in), Chuntang; ♂5, ♀10, Lachen; ♂2, ♀3, Ghoom; ♂1, Sukhipokhri; ♂3, ♀5, Batasia; ♀1, Narbong.

I used this name for specimens included in the Kumaon Collection, and gave the synonymy as accepted by Blanford. It now appears clear that these Sikkim specimens are identical with those from Kumaon. The type locality of Blyth's *jerdoni* is given as Sikkim and the description is so like that of *fulvescens* by Gray that although the type is not available for comparison I have no hesitation in thinking the name of *jerdoni* is a synonym of *fulvescens*.

In Report No. 14, Miss Ryley and in Reports Nos. 17 and 20 I myself used the name *jerdoni*, but though I am now able to say confidently that the name was misused in those cases I am yet not in a position to suggest another for there is still *cinnamomeus*, Blyth, from Shwegyen of which we have not yet a reliable specimen.

"Common at 5,000 feet and above. Fond of rocky situations and steep banks. It was often taken in traps set for Water-Shrews near the water."—C.A.C.

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(61) EPIMYS LEPCHA, Wr.

The Lepcha Rat.

1916. *Epimys lepcha*, Wroughton, Journ., B.N.H.S., Vol. XXIV, p. 428.
♂ 3, ♀ 11, Chuntang; ♀ 4, Lachen.

This rat is described earlier in this Journal (l. c.). It resembles *niviventer* fairly closely but the presence of the black shade on the shoulders and back and the extension of the colouring of the upper side as a collar on the lower throat and its further extension as a median line on the abdomen separate is sharply from that species.

(62) EPIMYS EHA, Wr.

The Spectacled Rat.

1916. *Epimys eha*, Wroughton, Journ., B. N. H. S., Vol. XXIV, p. 427.
♂ 11, ♀ 3, Lachen; ♂ 2, Thangu; ♂ 1, Ghoom; ♂ 1, Sukiapokhri.

This species described earlier in this Journal (l. c.), so far as I know, does not resemble any other Indian species. It is smaller than *fulvescens*, to which in the general colour of the upper side it is somewhat similar, but the black marks round the eyes, and the long hair of the under side, slate coloured basally with white tips, distinguish it at once from any other rat.

(63) MUS DUBIUS, Hodgs.

The Nepal House Mouse.

(Synonymy in No. 15.)

♀ 1, Sedonchen; ♂ 3, ♀ 7, Rongli; ♂ 4, ♀ 6, Lachen; ♂ 3, ♀ 2, Ghoom; 1 (not sexed, skull in), Darjeeling; ♂ 4, ♀ 1, Narbong; ♀ 2, Sivok; ♂ 2, ♀ 3, Jalpaiguri.

Having used the name *dubius* for the Kumaon house mice, these must also be classed under that name. Superficially I confess that I cannot distinguish them from *manei*. However as I pointed out in the Kumaon Report, should careful comparison later show that *dubius* and *manei* cannot be separated, *dubius* will be the name which will have to be used.

(64) MUS HOMOURUS, Hodgs.

Himalayan House Mouse.

(Synonymy in No. 15.)

♂ 1, Sedonchen; ♂ 1, Rongli; ♂ 1, Gangtok; ♂ 19, ♀ 18, Chuntang; ♀ 1, Ringin; ♂ 2, ♀ 2, Dikchu; ♂ 4, ♀ 4, Ghoom; ♂ 7, ♀ 4, Sukiapokhri; ♂ 6, ♀ 6, Batasia; ♂ 8, ♀ 3, Narbong; ♂ 2, Jalpaiguri.

(65) MUS PAHARI, Thos.

The Sikkim Hill Mouse.

1916. *Mus pahari*, Thomas, Journ., B. N. H. S., Vol. XXIV, p. 414.
♀ 3, Chuntang; ♂ 1, Batasia.

This mouse described by Mr. Thomas on an earlier page of this Journal (l. c.) though somewhat resembling the Burmese *Mus nitidulus* in general facies, is quite distinct from that species and much more nearly related to *manei*, *dubius*, &c. Its mammary formula is 3-2=10 as in these species and not 4-2=12 as in *nitidulus*.

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(66) MICROTUS (ALTICOLA) ROYLEI, Gray.

Royle's Vole.

(Synonymy in No. 15.)

♂1, Changu; ♂4, ♀6, Kapup; ♂5, ♀3, Gnatong; ♂7, ♀7, Lachen; ♂5, ♀1, Thangu.

Quite like the series obtained in Kumaon.

"A great burrower, but was also taken under rocks, bushes and walls. It is very gregarious and seems to be able to withstand intense cold."—C.A.C.

(67) CANNOMYS BADIUS, Hodgs.

The Bay Bamboo Rat.

1842. *Rhizomys badius*, Hodgson, Calc. Journ. N. H., ii, p. 60.
1842. *Rhizomys minor*, Gray, A. M. N. H., X., 266.
1891. *Rhizomys badius*, Blanford, Mammalia, No. 312.
♂1, (juv), Narbong.

I use the name *badius* as geographically speaking this specimen should belong to that species; it is however so young an animal that it is not identifiable with any certainty.

"Vernacular name:—Poo CHOKH (Lepcha).

At low elevations in the foot hills. The burrow which is large, is generally in the side of a bank from which large quantities of earth are thrown out."—C.A.C.

(68) OCHOTONA ROYLEI, Ogilb.

The Himalayan Mouse Hare.

1839. *Lagomys roylei*, Ogilby, Royles' III. Bot., &c., Himalaya, p. IXIX, pl. 4.
1841. *Lagomys hodgsoni*, Blyth., J. A. S. B., x, p. 817.
♂11, ♀13, Gnatong; ♂5, ♀3, Lachen.

In the report for Kumaon I labelled the Pikas obtained there with the name *roylei*, but the receipt of the present series and a more detailed examination of the literature and the specimens in the National Collection shows that I was mistaken. The type of *roylei* was from the "Choor Mountain" near Simla. As shown by the plate given by Ogilby and by the type (a mutilated flat skin now made up into a specimen) *roylei* is the same colour all over (upper side) as are these specimens from Sikkim. It is possible that the present series is separable from true *roylei* as a geographical race, but until we have a good series of topotypes of *roylei* to compare with it it is inadvisable to deal with the question.

I have not the type of *hodgsoni* to refer to but it seems to me certain from Blyth's description and plate that it is closely allied to, if not identical with, *roylei*. The type locality is Lahoul.

In these circumstances the Kumaon series can no longer be accepted as *roylei*. It is however Hodgson's *nipalensis* which is at once recognisable by its whitish collar, and ochraceous colouring of the head and shoulders to a greater or less extent.

There seems to be no doubt that there is a considerable seasonal change in the colouring of the various species of Ochtona so that it is most difficult to know what is due to geographical isolation and what to seasonal influence, I take this opportunity therefore to call the attention of members to the great desirability of obtaining specimens of these animals at all seasons of the year, at any given place. Another great desideratum is a good series of specimens of *roylei* from the type locality, *viz.*, the "Choor Mountain" near Simla.

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Vernacular names: CUMCHEN (Lepcha); GUMCHI-PICHI (Bhotia).

"Mouse hares are said to be common at Kapup during summer. I found none there in late October.

At Gangtok it is found among rocks where there is plenty of Alpine vegetation. It is always gregarious.

At Lachen I found it among rocks and in forests often making its house in the roots of trees. It burrows well.

At Thangu, though reported very common in summer, I did not see any so high up in winter, so it either hibernates or perhaps migrates to lower altitudes."—C.A.C.

(69) LEPUS RUFICAUDATUS, Geoff.

The Common Indian Hare.

(Synonymy in No. 15.)

♂ 2, Jalpaiguri; 1 (not sexed) ?, Nepal.

(*See* also Reports Nos. 19, 21 and 23.)

(70) PSEUDOIS NAYAUR, Hodgs.

The Bharal.

1833. *Ovis nayaur*, Hodgson, As. Res., XVIII, 2, p. 135.
1834. *Ovis nahoor*, Hodgson, P. Z. S., p. 107.
1840. *Ovis burrhel*, Blyth, P. Z. S., p. 67.
1843. *Ovis nahura*, Gray, List Mamm. B. M., p. 170.
1891. *Ovis nahura*, Blanford, Mammalia, No. 346.
♂ 3, Lachen.

Hodgson's first name, uncouth though it is, must be accepted, otherwise I have followed Lydekker's Catalogue.

"Vernacular names: SIBIK (Lepcha); NYEN (Bhotia).

Very plentiful in Thangu in January. I saw immense flocks, rams and ewes sometimes associating. The larger rams were sometimes in separate small flocks."

(71) MOSCHUS MOSCHIFERUS MOSCHIFERUS, L.

The Indian Musk Deer.

1758. *Moschus moschiferus*, Linnæus, Syst. Nat., p. 66.
1891. *Moschus moschiferus*, Blanford, Mammalia, No. 370.
♂ 1, ♀ 1, Lachen; 1, Lachung.

"Vernacular name: SUBUR (Lepcha).

At high elevations in forest. The Lepchas and Bhotias catch Musk Deer by making hedges along the ridges, leaving gaps in which nooses are set. Musk deer are poached to such an extent for the valuable musk pod that they have become very scarce."—C.A.C.

(72) MUNTIACUS VAGINALIS, Bodd.

The Bengal Rib-faced Deer.

♀ 1, Ringin; ♂ 1, Sukiapokhri; ♂ 1, Narbong; ♂ 1, Sivok.

(*See* also Report No. 20.)

"Common at all elevations up to about 8,000 feet in Darjeeling hill. Rare in Sikkim."—C.A.C.

SUPPLEMENT.

With Mr. Crump's Sikkim Collection were included some 50 specimens collected by Mr. R. S. Lister at Pashok, situated on the River Tista, quite on the outer fringe of the Himalayan foot hills at an altitude of 4,000 to

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5,000 feet. It is interesting to find the palæarctic genus *Talpa* represented and also *Soriculus*. May I ask Mr. Lister to try and get us a good series of that interesting animal *Vandeleuria dumeticola* and also of the "*Lepus hispidus*" mentioned by Mr. Crump.

The following is a list of the specimens obtained :—

1. TALPA MICRURA, Hodgson, ♂ 2.
2. PACHYURA sp., ♂ 8, ♀ 4.
3. SORICULUS NIGRESCENS, Gray, ♂ 1.
4. TOMEUTES LOKROIDES, Hodgson, ♀ 1.
5. VANDELEURIA DUMETICOLA, Hodgson, ♀ 1.
6. MUS DUBIUS, Hodgson, ♂ 5, ♀ 2, 1 not sexed.
7. MUS HOMOURUS, Hodgson, ♂ 3, ♀ 11.
8. EPIMYS RUFESCENS, Var., ♂ 5, ♀ 6.
9. EPIMYS NITIDUS, Hodgson, ♂ 2, 1 not sexed.
10. EPIMYS FULVESCENS, Gray, ♂ 2, ♀ 2.
11. GUNOMYS BENGALENSIS, Gray and Hardwicke, ♀ 1.

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THE EARTHWORMS OF LAHORE.

BY

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(*With Plates I and II.*)

The present paper is the outcome of investigations made at the suggestion of my worthy Professor, Lt.-Col. J. Stephenson, D.SC., I.M.S., Professor of Zoology and the Principal of the Government College, Lahore. The work was continued over a year because of the observations on the seasonal prevalence of the various forms, as also the very large collections made. For comparison the collections sent to Lt.-Col. Stephenson by the Indian Museum for identification were also examined, as also the private collections of the same distinguished authority. Moreover on the occasion of a visit to the Indian Museum, Calcutta, I was able, through the kindness of Dr. Annandale, Superintendent of the Indian Museum, to examine and compare my specimens with those named by Dr. Michaelsen (2).

I have to offer my sincere thanks to Lt.-Col. Stephenson for the kind help and advice given all the time while I was engaged on this work and for the facilities given.

In all, representatives of the genera *Helodrilus* (Hoffmstr. and Mchlsn.), *Pheretima* (Kinb. and Mchlsn.), *Lampito* (Kinb.) were found in Lahore, while two subgenera of the genus *Helodrilus*, viz., *Allolobophora* (Eisen and Rosa) and *Bimastus* (H. F. Moore) were to be found. The various species found are the following:

1. *Helodrilus (allolobophora) caliginosus* forma *trapezoides* (Dug.).
2. *Helodrilus* (*Bimastus*) *parvus* (Eisen).
3. *Pheretima hawayana* (Rosa).
   - (*a*) Subspecies typica (Rosa).
   - (*b*) Subspecies barbadensis (Beddard).
4. *Pheretima posthuma* (L. Vaill.).
5. *Pheretima heterochæta* (Mchlsn.).
6. *Lampito mauritii* (Kinb.).

The nomenclature followed is that given by Michaelsen (1 and 2) except in the case of the two subspecies *typica* and *barbadensis* of *Pheretima hawayana*, this is fully treated in remarks at the end of the species.

KEY FOR THE IDENTIFICATION OF THE VARIOUS GENERA.

Clitellum saddle shaped over many segments..... *Helodrilus*.
Clitellum as a ring over three segments, xiv-xvi.... *Pheretima*.
Clitellum as a ring over four segments, xiv-xvii.... *Lampito*.

The two subgenera *Allolobophora* and *Bimastus* can be distinguished by the very small size and reddish colour of *Bimastus* as compared with very large size and brown colour of *Allolobophora*.

SEASONAL VARIATION IN THE NUMBERS OF VARIOUS SPECIES OF EARTHWORMS.

In *December* 1913, when the work of collection was begun, but for a few specimens of *Pheretima posthuma* found very deep down in moist and shady places, and large numbers of specimens of *Pheretima hawayana* forma *typica* usually found under flower pots or large wooden logs or stones, the predominant forms were *Helodrilus caliginous* forma *trapezoides* and the small

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Helodrilus parvus. This remained the condition during *January* and *February* 1914. Towards the end of *February* 1914 a few specimens of *barbadensis* form of *Pheretima hawayana*, and *Pheretima heterochæta* were also picked up. *Helodrilus caliginosus* was met with now in very much smaller numbers so much so that in *May* not a single specimen was found. The various species of the genus *Pheretima* have increased in numbers in the following order:—

Pheritima hawayana, both typical and *barbadensis* forms, *Pheretima heterochæta*, *Pheretima posthuma*. *Pheretima hawayana* forma *typica* was found throughout in very large numbers, and *Pheretima posthuma* appears to be in very much smaller numbers than all others. *Helodrilus parvus* is always found with other forms as a small roundish worm. Not a single specimen of *Lampito mauritii* was found, the time during which it is found appears to be the months of August to November, for it was found by Lt.-Col. J. Stephenson, D.SC., I.M.S., at that time.*

HELODRILUS (ALLOLOBOPHORA) CALIGINOSUS, Sav.

Forma *trapezoides* (Ant. Dug.).

Habitat.—Very widely distributed throughout the city of Lahore, was found in very various localities, in gardens, in cultivated lands, in damp soil near wells, under flower pots, large stones or wooden logs, but in all cases where it was found, the soil was very much more damp than in the situations where the other worms were found; hence from the seasonal variations in the numbers of this worm and the localities in which it was found it follows that the worm loves cold and moisture more than others.

External Characters.—

Length—105—140 mms., diameter 4-5½ mm. at the posterior end to 6 mm. in the anterior part of the body.

Segments 133-190, usually about 145.

Colour.—Very different in specimens from different localities. It varies from pale white to dark brown, usually dark brown to brown with a purplish tinge, light brown ventrally; clitellum distinctly paler and well marked.

Prostomium epilobous ($\frac{2}{5}$—$\frac{1}{3}$) with a furrow cutting off the backwardly projecting tongue from the rest; the prostomium is partly under cover of the first segment. Segments i—vi consist of single annuli, the rest of two annuli in some of the larger segments each annulus is again cut up in two by a furrow.

Setæ closely paired, 8 in each segment.

Median lateral distance is nearly equal to the median lateral while much smaller than the median dorsal.

(aa=4-5 ab=4-5 cd=bc) dd=½ u nearly.

The first segment is without setæ, but all the others have rather large ones, the setæ are quite distinctly seen even on the clitellum, size of the setæ varies, and by the size and appearance two types of setæ can be distinguished.

1. Setæ on the clitellum and segments ix, x, xi, xv, xvi especially setæ *a* and *b* are rather slender and very much pointed. The setæ are very much curved posteriorly, while nearly straight at the free anterior end, in some cases a little bifurcation of the free anterior end is also seen (Fig. 11, Plate 1).

Size.—Length ·8—·9 mm.

Thickness ·0208—·0260 mm.

Thickness at the *nodulus* ·0364 mm.

* Since the above was written, I have secured specimens of this form in Lahore during the months of October and November 1915.

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2. Other setæ are nearly of the same size, they are stouter and are *f* shaped being slightly curved anteriorly as well as posteriorly in opposite directions (Fig. 12, Plate I).

Size.—Length ·5 mm.
Thickness ·0416 mm.
Thickness at the *nodulus* ·0572 mm.

The dorsal pores are large and conspicuous, the first is in intersegmental furrow $\frac{9}{10}$. In some specimens distinguishable on the clitellum also.

Clitellum (Fig. 5, Plate I) saddle-shaped, very much raised than the rest of the body, ventrally the segments are not modified and the intersegmental furrows are quite distinct.

Usually the clitellum occupies segments xxvii,—xxxiii or xxxiv (7 or 8) as is stated by Michaelsen (1) and by Piguet (3), but it was observed that in some specimens it occupied xxvi,—xxxiv (=9 segments), while in others xxvii—$\frac{1}{2}$ xxxv (=$8\frac{1}{2}$ segments) in others xxvi—$\frac{1}{2}$ xxxv (=$9\frac{1}{2}$ segments) and in still others xxvi-xxxv (=10 segments).

Male pores on segment xv appears as transverse slits between two thick glandular looking lips which overhang anteriorly as well as posteriorly, the lips extend on each side and meet with those of the opposite side and extend on to segments xiv and xvi also (Fig. 9, Plate I).

Female pores indistinct when seen, they are small openings on segment xiv slightly internal to the line of the male pores.

Spermathecal pores not seen.

Genital markings.—Glandular cushion-like borders in the form of ridges continuous with the ventro-lateral borders of the clitellum are present from segments xxxi-xxxiii usually, but in other cases the cushions extend variously on the right and left sides of the same worm (Right $\frac{1}{2}$ xxxi—$\frac{1}{2}$ xxxiv, Left xxx—xxxii or *vice versa* and so on). There are glandular oval patches on the clitellum ventrally on segments xxvii, xxix, xxx, xxxi, xxxii or on xxvii, xxix, xxxi and still differently in others; the glandular patches are in some cases found on both sides, in others alternately on the right and left sides, and in others on some segments on both sides, and on the rest on one side only. When on both sides the glandular areas may meet in the middle line forming a continuous ridge. The glandular areas surround the setæ *a* and *b* (Fig. 10, Plate I).

Setæ a and *b* on segments ix, x, xi are in all cases surrounded by glandular areas which meet each other and in the middle line to form a raised patch over all the three segments (Fig. 9, Plate I). The thick glandular lips overhanging the male pores and encroaching on the segments xiv and xvi may also be noted here.

Internal anatomy.—First definite septum is $\frac{4}{5}$ septa $\frac{5}{6}$—$\frac{7}{10}$ all thickened while $\frac{7}{8}$ is very much thickened than others, $\frac{10}{11}$, $\frac{11}{12}$ also thickened.

Alimentary tract.—The mouth leads into the *buccal cavity* which is small and occupies the first three segments. The *pharynx* which follows has thick muscular walls connected with the body-wall by strands of muscle fibres which run obliquely backwards, it extends up to the vii segment.

The *Oesophagus* is a straight tube extending from the pharynx to the xiii segment, it appears dilated in each segment while constricted intersegmentally. In the segment xi are given off short lateral diverticulæ or pouches from the œsophagus, these lie in segment x. The *calcareous glands* are two lateral protuberances on the sides of the œsophagus in xi and xii; these are hollow and in longitudinal sections show lamellated appearance; these communicate with one another and with the œsophageal pouches lying in front of them. The *crop* is a large dilated portion of the alimentary canal in segments xiii—xvi. It is a thin walled sac and is separated from the thick walled, *gizzard*, which follows, by a distinct groove. The *Gizzard*

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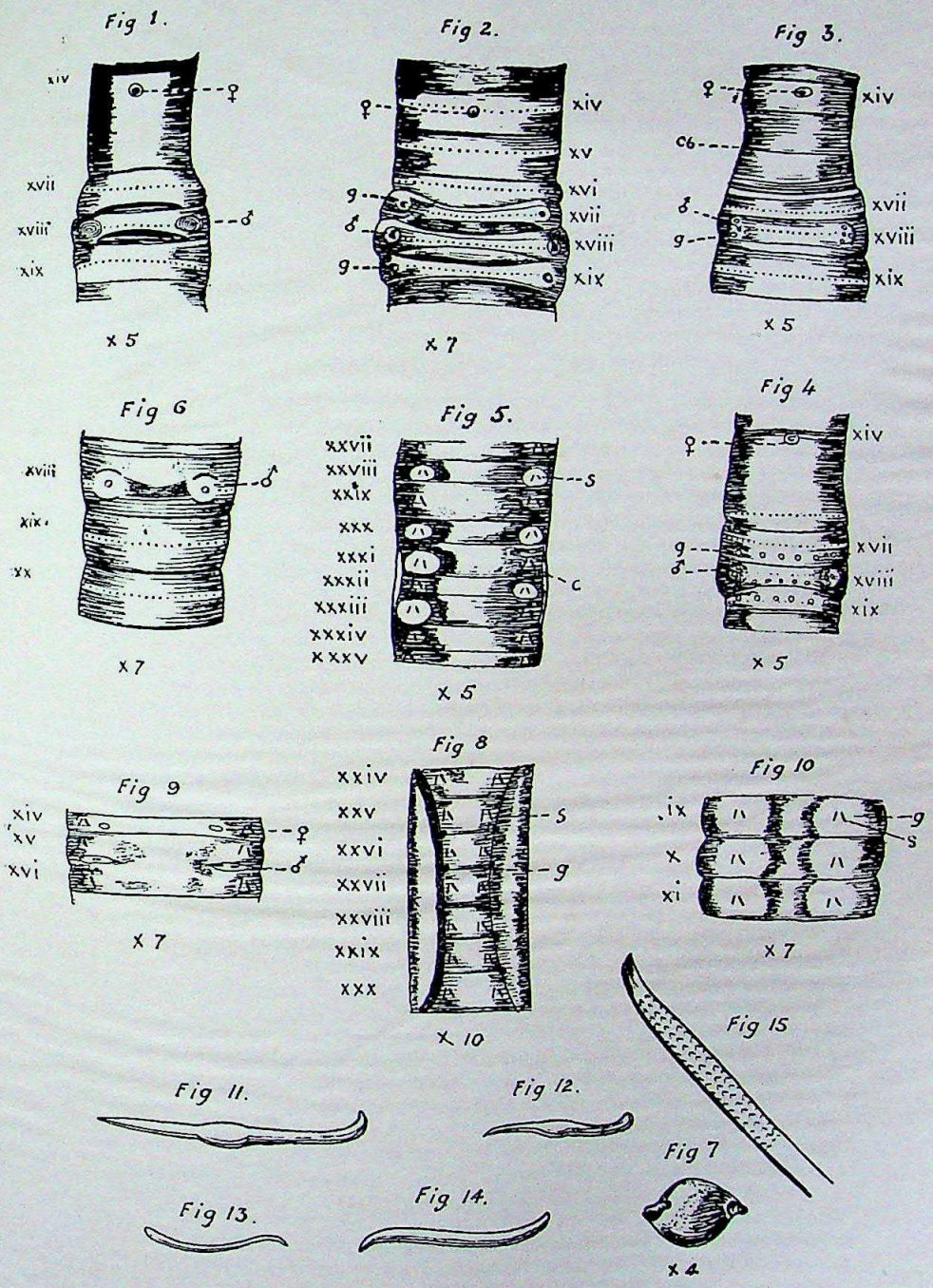

Baini Parshad

THE EARTHWORMS OF LAHORE.

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occupies xvii—xxix sometimes segment xx is also encroached on. Behind the xxix or in other cases xx segment the intestine stretches without change to the anus. It is a thin walled tube slightly constricted intersegmentally owing to the septa. The *typhlosole* is a deep longitudinal groove along the dorsal surface of the intestine projecting into its cavity, owing to the typhlosole the appearance of the intestine is quite horse-shoe shaped in transverse sections.

There are 6 pairs of *hearts* in segments vii—xii.

Excretory system.—*Nephridia* are of the meganephric type. They are arranged in pairs alongside the intestine in each segment, but for the first four and a last few in which they are absent.

The *reproductive* organs are lodged in segments ix—xv.

Male organs.—The two pairs of testes and the large fimbriated funnels of the vasa deferentia lie in segments x and xi.

The *testes* are not enclosed in the testicle sacs but are freely projecting from the septa. The testes are small and sometimes missing in large specimens due to degeneration, the worm being protandrous.

There are four pairs of *seminal vesicles* in segments ix-xii those of the segments ix and x are rather small.

Female organs.—A pair of pear-shaped *ovaries* and funnels lie in the xiii segment. A pair of large and very vascular egg sacs in the xiv segment are attached to the septum $\frac{13}{14}$.

Spermathecæ.—Two pairs in segments x and xi, their openings to the exterior would hence be in the intersegmental furrows $\frac{9}{10}$ and $\frac{10}{11}$. They are small globular structures, with wall only one cell thick, they lie close to the intestine, have no diverticulum, but a very small duct is seen leading to the exterior. (Fig. 1, Plate II.)

Helodrilus (Bimastus) parvus (Eisen).

Habitat.—Very widely distributed throughout, large numbers of it were found along with other worms.

External Characters—

Length.—45-54 mm., diameter 1-2¼ mm.

Segments 85-116, generally the number is somewhere about 90.

Colour.—Reddish, clitellum whitish and well marked.

Prostomium epilobous ($\frac{2}{3}$—$\frac{1}{2}$).

Setæ closely paired, four pairs in each segment.

$ab=\frac{1}{4}$ $aa=\frac{1}{3}$ $bc=1\frac{1}{4}$ cd $dd=\frac{1}{2}$ u nearly.

The first segment is without setæ, all others, the clitellum included, have the four pairs of setæ each.

Each seta has the posterior end very much curved while the anterior end is distinctly pointed. The nodulus is not well marked. The *measurements* of a seta are: *Length* 22 mm., *thickness* =·016 mm.

First dorsal pore in the intersegmental furrow $\frac{5}{6}$. The dorsal pores are distinctly seen on the clitellum also.

Clitellum (Fig. 8, Plate I).—Saddle-shaped occupying segments xxiv—xxx (=7 segm.). In some specimens segment xxxi also was encroached on dorsally.

Male pores are deep transverse clefts in broad longitudinal glandular cushions on segment xv, the cushions in some cases become raised up and appear as papillæ. The male pores are in line with the seta *b*.

Female pores mostly invisible, in rather large specimens seen as minute openings on segment xiv, slightly internal to the line of the male openings.

No spermathecal pores as there are no spermathecæ.

Genital markings.—Small glandular papillæ internal to the ventro-lateral borders of the saddle-shaped clitellum on segments xxv, xxvi, xxix, xxx.

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Internal anatomy.—The worms being too small for dissection, the internal anatomy was determined by examining the worms while in *Cedarwood oil* when it is nearly transparent and the rest of the anatomy was made out from vertical longitudinal, horizontal longitudinal, and transverse sections. The sections were either stained with Delafield's hæmatoxylin or with Heidenhain's iron-hæmatoxylin followed by Eosin.

First definite septum is $\frac{3}{4}$. Septa $\frac{6}{7}$ and $\frac{7}{8}$ are thickened.

Alimentary canal.—The *mouth* is overhung by the *prostomium*, and leads into the *buccal cavity* which extends through the first three segments. The buccal cavity is followed by the *pharynx* which has a rather thick muscular wall and the upper surface of it is covered over by a large mass of glandular tissue, the septa extend into this tissue and cut it up according to the segments in which it lies. The pharynx finishes in the sixth or in some cases in the seventh segment whence the œsophagus begins. The *œsophagus* is a straight tube extending up to the fourteenth segment. Only two pairs of *calciferous glands* are to be seen lying in segments xi and xii, the one in segment xi being really a pouch in the side wall of the œsophagus, but the opening of the gland in the xii segment into the œsophagus could not be seen, it merely appeared as a thickening in xii segment showing in sections the characteristic lamellated appearance of the calcareous glands, nor was the opening of this into the anterior one to be made out. The *crop* which follows is a thin walled dilatation of the alimentary canal lying in segments xiv and xv. The *Gizzard* lies in segments xvi and xvii. Its wall consists of the following layers :—

1. Outermost is a single layer of *longitudinal muscular fibres.*
2. Many layers of *circular muscular fibres* come next.
3. A layer of *columnar epithelial cells* is next seen in some places between the bases of the epithelial cells small rounded cells are also seen filling up the gaps. This layer secretes the *chitinous* lining of the gizzard.

Behind the seventeenth segment the intestine extends as a wide thin walled sacculated tube up to the anus; the intestine in some cases was seen to push the septum $\frac{17}{18}$ forwards on the sides of the gizzard. The intestine is constricted intersegmentally owing to the septa while sacculated in the segments. In the first four or five segments the intestine in the intersegmental, regions sends out villus-like projections, which may branch; this appears to be a contrivance for increasing the absorptive surface of the intestine. The *typhlosole* becomes well marked after segment xix and in transverse sections appears as a deep ridge projecting into the cavity of the intestine.

There are five pairs of hearts in segments vii—xi, the ones in segment v being rather small ones.

Nephridia.—are of the *meganephric* type, they are arranged in pairs on each side of the intestine except for the first five segments and the last few in which they are absent.

The *reproductive organs* are lodged in segments xi—xv.

Male organs.—The two pairs of *testes* lie in segments xi and xii free and not enclosed in the testicle sacs. The *seminal funnels* also lie in segment xi and xii. There are only two pairs of *seminal vesicles* depending from the septa $\frac{10}{11}$ and $\frac{11}{12}$ and lying in the segments xi and xii.

Female organs.—A pair of *ovaries* and the *oviducal funnels* lie in the xiii segments, the oviduct pierces the septum $\frac{13}{14}$ and opens on each side on the xiv segment.

Spermathecæ absent.

Cocoon formation was observed in one specimen, when found, the cocoon was seen as a raised projection of the clitellum already formed all round the clitellum as a cylinder-like covering, after about two minutes

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the animal began to move in the tube with the anal side forwards and it appeared as if the worm was sliding out of the cocoon. On the cocoon coming to the region of the genital organs, the worm became still for a time and then again the wriggling movement began, and the animal became free of the cocoon in about ten minutes from the time it began the operation. The measurements of the cocoon are as following :—*Length* $2\frac{1}{4}$ mm., *thickness* $1\frac{1}{2}$mm. (Fig. II, Plate II.) It was of rather a pale white colour, spindle shaped, more or less with a furrow on the original ventral surface and the two ends appeared rather shrivelled up owing to contraction. The cocoon was broken with needles and four *ova* found in it contained in an albuminous matter. No *spermatozoa* however could be distinguished.

Remarks.—The worms required for sectioning were kept in dishes containing wet blotting paper which they quite eagerly devoured at first, the earth gradually passing out of the intestine. They were kept for twenty-eight days in this dish, all except two out of a dozen were found alive and it was seen that their colour became distinctly pinkish from the original red. At this time the worms appeared rather sickly and were very sluggish in their movements ; on the blotting paper and dish being changed they became rather active, but only for a very short time when they were killed and preserved.

Pheretima (Kinb. and Mchlsn.)

The various worms of this genus can be distinguished as follows :—

1. No genital papillæ surrounding the male pores or anterior to them on segment xvii (Fig. 1, Plate I) .. .. *Pheretima heterochæta.*
2. A pair of papillæ on segments xvii and xix slightly internal to the male pore on each side (Fig. 2, Plate I) .. .. .. *Pheretima posthuma.*
3. Male pore surrounded by two or three genital papillæ on a raised glandular patch of skin, also five to seven papillæ between male pores and a few on segments xvii and xix also (Fig. 3, Plate I) .. .. *Pheretima hawayana* subspecies *typica.*
4. Male pore as in the *typical form* but there are no papillæ between the male pores (Fig. 4, Plate I) .. .. *Pheretima hawayana* subspecies *barbadensis.*

Pheretima hawayana—subspecies *typica* (Rosa).

Was found in very large numbers throughout. The specimens obtained during the months of December and January were very much smaller in dimensions than those found later in March and April which were very much larger and more robust.

External characters—

Length.—100-120mm., diameter 3-4mm., segments about 90.

Colour.—Yellowish brown.

Prostomium epilobus $\frac{1}{2}$. Segments i—v consist of single annuli vi of two annuli, all the rest except a few at the end of three annuli each ; of those at the end first few have two annuli each, while the rest do not show any secondary annulation.

Setæ.—Usually there is a *dorsal* and a *ventral* break.

$$aa = 1\frac{1}{4}\,ab \qquad zz = 1\frac{3}{4}\,yz$$

$$ab \angle bc \angle cd \ldots\ldots yz \,7\, xy \ldots\ldots ab \angle yz$$

In some cases the ventral break was not to be seen and in others in the posterior part of the body the setæ were disposed in a more or less

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unbroken ring. The setæ are somewhat enlarged on segments vii and viii. Clitellum all over devoid of setæ but in some specimens there were setæ on segment xvi ventrally. Numbers of setæ $\frac{20}{v}$ $\frac{41}{vii}$ $\frac{49}{xi}$ $\frac{55}{xix}$ $\frac{58}{xxvi}$

First dorsal pore in the intersegmental furrow $\frac{10}{11}$ the dorsal pores are easily seen on the clitellum as well.

Clitellum as a ring from about $\frac{3}{4}$ xiv or xiv—xvi (= $2\frac{3}{4}$ or 3 segments).

Male pores on small papillæ on segment xviii about $\frac{1}{3}$ *u* apart, 18 setæ intervene.

Female pore in a transversely extended depression midventrally on the anterior part of segment xiv.

Spermathecal pores usually two, in some cases three pairs of openings in the intersegmental furrows $\frac{5}{6}$—$\frac{6}{7}$ or $\frac{5}{6}$—$\frac{7}{8}$. In an abnormal specimen there were two spermathecal pores in the furrow $\frac{5}{6}$ on the right side corresponding to two spermathecæ in segment vi on the right side and one on the left side.

Genital markings.—Usually 3 papillæ, surrounding the male pore on segment xviii, are situated on an oval glandular patch of skin, the papillæ merge into one another. Internal to the male pores at a slightly posterior level behind the setal ring two to seven papillæ more are to be seen. Five to seven papillæ are seen on each of the segments xvii and xix also. Two or in one case four papillæ were seen on the segment vii and a single one sometimes on the viii segment as well. The papillæ were rather conical projections with a dark centre.

Internal anatomy.—First definite septum $\frac{3}{4}$. Septa $\frac{5}{6}$ and $\frac{6}{7}$ moderately thickened, $\frac{8}{9}$, $\frac{9}{10}$ absent, $\frac{10}{11}$—$\frac{12}{13}$ also somewhat thickened. In some cases a rudimentary septum $\frac{9}{10}$ resent.

Alimentary tract consists of the following parts:—The *Buccal cavity* in the first two segments is followed by the *Pharynx* i—iv with large pharyngeal glands in segments iii and iv situated dorsally as well as laterally, no internal openings of these glands into the pharynx could be discerned. *Oesophagus* occupying segments v—vii with lateral pouches in vi but no calcareous glands; these lateral pouches were very large in some cases. *Gizzard* in segments viii and ix as a thickened globular sac with a conical posterior end. Intestine rather thin up to septum $\frac{14}{15}$ then becomes wider and passes to the end unchanged. It is covered all round by a thick layer of yellow *chloragogen* cells. The *typhlosole* is seen as a very small ridge dorsally projecting into the cavity of the intestine. *Intestinal diverticula* hollow, conical, beginning from segment xxvi and continued forward to segment xxi. There are from five to seven secondary diverticula of a roundish appearance on the primary diverticulum of each side.

There are four pairs of hearts in x—xiii, there are also a pair of palmate *blood glands* lying on each side of the dorsal blood vessel in each segment after the xxiii segment.

The *nephridia* are of the *micro-nephric* type, diffused on the body wall as well as on the septa. Two large, masses of these nephridia, very richly supplied by blood vessels, were also seen on each side of the œsophagus in segment vii.

The *reproductive organs* are lodged in segments x—xxii.

Male organs.—The two pairs of *testes* lie in the median *testical sacs* in the segments x and xi. The lateral *seminal vesicles* lie in the segments xi and xii depending posteriously from septa $\frac{11}{12}$ and $\frac{12}{13}$. These are irregularly lobulated. The *vas defereus* in connection with the seminal funnel lying in segment curves over the one from the anterior segment, and this *vas defereus* goes along the outer side of the one from the anterior sac. Both the *vasa defe-*

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rentia go side by side separately and are covered by the large masses of ramifying nephridial tubules, they are contives separately in the thickened and curved prostatic duct and do not open into the gland. (Fig. III, Plate II.) This is a difference from what has been stated by Lt.-Col. J. Stephenson, D.Sc., I.M.S., in his paper (3). The vasa deferentia it appears unite with the prostatic duct at its ending point only.

The *prostates* are large occupying segments xvii-xviii divided up into a corresponding number of lobes by the septa; there is a very deep notch on the inner side in segment xix and continued upwards in segment xviii as well. The thick yellow duct begins in this notch in segment xix and after making an *S* shaped loop opens at the male pore in segment xviii. Moreover it was noticed that there are five additional *primary prostatic ducts* from the lobes of the prostate beginning in the substance of the gland and coming to open into the thick yellow duct. No account of these was given hitherto in all the literature consulted.

Accessory prostates in segments xvii, xviii and xix corresponding in position to the papillæ on the outer surface are to be seen. A glandular mass in segment vii was also to be seen in the position of the papillæ externally.

Female organs.—The *ovaries* are large masses connected with the septum $\frac{12}{13}$ and laying in segment xiii. Oviduct funnels lie in xiii, the *oviducts* of the two sides as far as could be followed did not unite but appeared to open separately. A large *receptaculum ovorum* formed as a bulging in septum $\frac{13}{14}$ could also been seen internally to the funnel of the oviduct.

Spermathecæ 2 or 3 pairs mostly two.

The ampulla is ovoid in shape with a small protuberance at the head, it narrows gently into the duct which is well marked and slightly longer than the ampulla. The diverticulum is a thin narrow tube slightly dilated in its distal portion; it reaches nearly to the half of the ampulla. (Fig. IV, Plate II.) The diverticulum arises quite close to the base.

Pheretima hawayana—subspecies *barbadensis* (Beddard).

Found all over Lahore in fairly large numbers.

External characters—

Length.—90-120 mm., diameter 4—4½ mm., segments 85—92.

Colour.—Dirty yellow to brown.

Prostonium epilobous, ($\frac{2}{3}$.) Segments i—iv consist of single annuli v-vi of two annuli each, all the rest of three annuli each.

Setæ in unbroken rings, clitellum usually without setæ but one sexually mature specimen from the Bhati gate gardens had 3 distinct rings of setæ on it. Numbers of setæ $\frac{50}{\text{vii}}$ $\frac{58}{\text{xi}}$ $\frac{60}{\text{xix}}$ and 60 usually in the hinder segments.

First dorsal pore in the intersegmental furrow $\frac{9}{10}$, the pores are distinctly visible on the clitellum as well.

Clitellum as a ring xiv-xvi (=3 seg.); very much darker in colour and of a much lesser diameter than the rest of the body. (Fig. 3, Plate I.)

Male pores on raised ovoid papillæ on segment xviii $\frac{2}{3}u$ apart, 21 setæ intervening.

Female pore in a deep transversely elongated depression on the anterior part of segment xiv.

Spermathecal apertures usually two, seldom three pairs in the intersegmental furrows $\frac{5}{6}$ $\frac{6}{7}$ or $\frac{5}{6}$-$\frac{7}{8}$.

Genital markings.—Three papillæ surrounding the male pore on each side, in some cases one or two papillæ on segments xvii and xix are also seen. One or two papillæ on segments vii and viii are also seen a little in front of the setal rings.

Internal anatomy.—First definite septum is $\frac{2}{3}$. Septa $\frac{5}{6}$ and $\frac{6}{7}$ moderately thickened, $\frac{7}{8}$, $\frac{8}{9}$ wanting and the septa $\frac{9}{10}$—$\frac{11}{12}$ are also thickened.

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Intestinal diverticula.—Simple originating in xxvi segment and coming forwards up to the segment xxii.

Testicle sacs in x and xi separate from the lateral *seminal visicles* in segments xi and xii. The seminal vesicles are compact and not much lobulated.

Prostate gland occupies segments xvii—xxi. *Prostatic duct* thick and straight opening in segment xviii to the exterior, into it open the five primary prostatic ducts as in *Pheretima hawayana* typical form. No accessory prostates could be made out. The *vas defereus* in connection with the seminal funnel in the xi segment curls over the one from the septa x, and passes back external to it. The two vasa deferentia open separately close to each other into the thick prostatic duct.

Spermathecæ two seldom, three pairs in segments vi and vii or in vi—viii. The ampulla is of an inverted pyriform shape with a notch on one side. The duct is well marked and slightly smaller in length than the ampulla. The diverticulum is smaller in than the ampulla and arises at a much higher level from the duct than in *Pheretima hawayana*. (Fig. V, Plate II.)

Remarks.—There has been a good deal of difference of opinion as to whether *Pheretima barbadensis* should be considered as a subspecies of the typical form of *Pheretima hawayana* or as a distinct species. Stephenson discussed the whole fully in his papers "On a collection of Oligochæat mainly from Ceylon" in the "*Spolia zeylanica*" (4) and in "Contributions to the fauna of Yunan" (3) and arrived at the conclusion that *Pheretima barbedensis* should be classed as a subspecies of the typical form *Pheretima hawayana*. But from the very large number of forms collected in Lahore and examined I have to conclude that these two should be classed as two distinct subspecies. The chief points in which the *barbadensis* form differs the from typical *hawayana* are :—

Unbroken rings of setæ, clitellum occupying the whole of three segments without setæ usually and being well marked owing to being lesser in diameter than the rest of the body. (Fig. 3, Plate I.) Absence of *genital papillæ* in the interval between the male pores and on segments xvii and xix and the corresponding absence of the accessory glands internally ; the genital papillæ surrounding the male pore being scattered and not fused (as in *Pheretima hawayana*) to form the oval area, the prostatic duct being straight and not curved in an shaped manner; the difference in the shape of the *spermathecal* ampullæ and the point of origin of the diverticulum and in the *intestinal cæcæ* being simple.

While working for some time at the Indian Museum, Calcutta, I examined the Yunan and Ceylon specimens mentioned by Stephenson in his papers (4, 5) and I find that the abovementioned opinions are in no way effected by their examination.

Pheretima posthuma (L. Vaillant).

Very widely distributed though not in so large numbers as the other species of the genus *Pheretima*.

External characters—

Length.—115-130 mm., diameter 5 mm., Segments about 140.

Colour.—Rich, brown.

Prostomium tanylobous.—Segments i—vi consist of single annuli vii and viii of two annuli and the rest of three, the secondary annulation is lost towards the posterior end.

Setæ form an unbroken ring, clitellum was sometimes without setæ, in other cases three indistinct rows of setæ were to be seen on it. Numbers of *setæ* $\frac{144}{vi}$ $\frac{108}{x}$ $\frac{95}{xx}$ $\frac{92}{xxxi}$.

First dorsal pore in intersegmental furrow $\frac{12}{13}$.

Clitellum as a ring occupying segments xiv—xvi (= 3 seg.).

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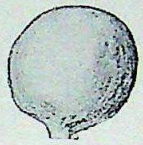

Fig. I.
× 25.

Fig. II.
× 10.

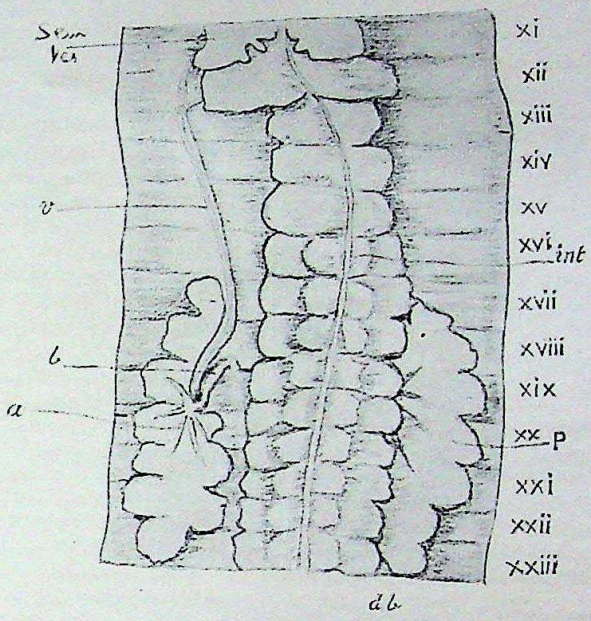

Fig. III.
× 5.

a Primary prostatic ducts, *b* Prostatic duct, *db* Dorsal blood vessel, *int* intestine, *p* prostates, *sem ves* vesicula seminalis, *v* vasa deferentia. Lateral blood vessels not shown

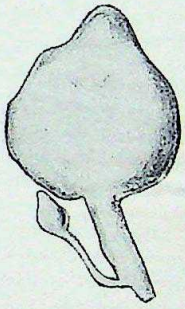

Fig. VII.
× 20.

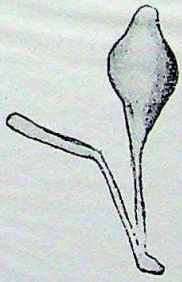

Fig. V.
× 10.

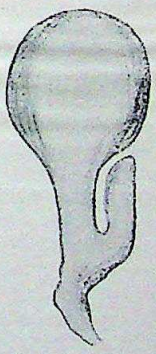

Fig. VI.
× 20.

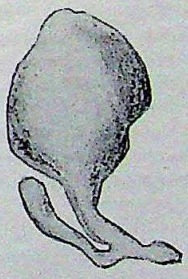

Fig. IV.
× 25.

Fig. VIII.
× 15.

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Male pores on large elevated papillæ on segment xviii about $\frac{1}{4}u$ apart from each other 19 or 20 setæ intervene.

Female pore as a small opening in the midventral line on segment xiv on the setal ring.

Spermathecal pores, four pairs in the intersegmental furrows $\frac{5}{6}$—$\frac{8}{9}$ situated ventro-laterally $\frac{1}{4}u$ apart 47 setæ intervene.

Genital papillæ.—In line with or slightly internal to the line of the male pores there are a pair of papillæ on the segments xvii and xix respectively on each side ; in addition to these in some cases there were papillæ on segments xx, xxi, xxii in line with the one on segment xix, the limits varied on both sides even in the same specimen. In one there were papillæ on xix, xx, xxii segments on the right side, but only on xix on the left side.

Internal anatomy.—First definite septum is $\frac{4}{5}$, septa $\frac{5}{6}$—$\frac{7}{8}$ very much thickened. Septum $\frac{8}{9}$ is slightly so, while the septum $\frac{9}{10}$ or $\frac{9}{10}$ is missing, septum $\frac{12}{13}$ is also thickened.

The gizzard occupies segment vii or segments viii and ix when septum $\frac{8}{9}$ is missing. The *intestine* lies in a straight line between the gizzard and the anus, it becomes wider after segment xiv. The typhlosole is not so well marked, but is only a slight ridge projecting into the intestine. There are a pair of *intestinal diverticula* in xxvi, these are elongated, conical without secondary projections, they extend forwards up to segments xxi.

Two pairs of hearts in xii and xiii. There are a pair of "*blood glands*" in each segments lying on either side of the dorsal blood vessel after segment xxvi.

The *Nephridial System* is *micronephric*, the nephridia are a system of diffused tubules with many funnel-like openings in each segment ; a large mass of nephridial tubes is to be seen on either side of the œsophagus in segment vi.

Two median *testicle sacs* in segments x and xi, and three pairs of lateral *seminal vesicles* in x, xi and xii segments ; the seminal vesicles communicate with each other and are of a large size.

The *Prostates* are large occupying segments xvi—xxi. They are irregularly lobulated. The thick prostatic duct begins in line with the septum $\frac{18}{19}$ and loops forwards to open at the male pore in xviii segment.

Accessory glands lie close to the prostates in segments xvii and xix.

Ovary and *oviduct* funnels lie in segment xiii.

Spermathecæ (Fig. VI, Plate II) are four pairs in segments vi—ix. The ampulla is ovoid or somewhat globular in shape, the duct is slightly longer than the ampulla ; the diverticulum is rather elongated and narrow and reaches up to the ampulla.

Cocoons of Pheretima posthuma.—While digging for this worm a number of cocoons were also found. These were of a faint yellowish colour of the following size :—*Length* $4\frac{1}{2}$ mm., *diameter* $3\frac{1}{4}$ mm. These were barrel shaped pointed at both ends and appeared much shrivelled at both ends. (Fig. 7, Plate I). Some were in very early stages showing eggs only while one contained a single fully developed worm lying in an albuminous mass, with no trace of the other eggs. It is rather curious that of the many eggs laid in a cocoon only a single one should develop, the rest all degenerating to supply food for that single individual. This is well known in other cases.

Pheretima heterochæta (Mchlsn.).

Fairly widely distributed throughout Lahore.

External characters—

Length.—125-135 mm., diameter 4-5 mm. Segments about 110.

Colour.—Yellowish or brownish, clitellum however always brownish.

Prostomium epilobous ($\frac{2}{3}$.) No secondary annulation of the segments.

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Setæ raised on a distinct ridge which is very prominent in the post-clitellar region. There is no dorsal break but a ventral break is present in the preclitellar region. Behind the clitellum the line of Seta *a* is not quite straight as it is in front of the clitellum, hence the Setæ there appear more or less irregularly arranged.

Preclitellar arrangement a a = $1\frac{1}{3}$ a b > b c > c d .....

Setæ *a* and *b* are larger than others.

First dorsal pore on the intersegmental furrow $\frac{11}{12}$ pores, indicated on the clitellum also.

Clitellum as a ring, smooth with no indication of setæ or intersegmental furrows, usually xiv—xvi (= 3 segments) in some cases posterior part of segment xiii also encroached on dorsally.

Male pores on slightly elevated papillæ on segment xviii $\frac{2}{3}$ *u* apart 14 setæ intervening.

Female pore on segment xiv on a large papilla in a circular depression.

Spermathecal pores.—Four pairs in the intersegmental furrows $\frac{5}{6}$—$\frac{8}{9}$ on the ventro-lateral borders.

Genital markings.—Two pairs of median papillæ on segments vii and viii, also a papilla on each of the four segments v—viii just overhanging the spermathecal pores. The arrangement was not so definite in all specimens in some cases there being only one or two on vii and viii segments and no others.

Internal anatomy.—Septum $\frac{4}{5}$ is the first definite one, septa $\frac{5}{6}$—$\frac{7}{8}$ thickened, $\frac{8}{9}$—$\frac{9}{10}$ wanting, $\frac{10}{11}$ and $\frac{11}{12}$ also thickened.

Gizzard between $\frac{7}{8}$—$\frac{10}{11}$ somewhat conical, narrower in front than behind. *Intestinal cæcæ* are simple and lie in segments xxvi—xxii.

Four pairs of *hearts* in segments x—xiii.

The *reproductive organs* are lodged in segments x—xxi.

Male organs.—Two pairs of *testes* lie in the median *testicle sacs* in segments x and xi; these communicate with each other. Two pairs of *seminal vesicles* in segments xi and xii depending from septa $\frac{10}{11}$ and $\frac{11}{12}$. The seminal vesicles are lobed irregularly.

Prostates.—Usually one of the two is reduced and the other quite absent; in a few specimens both were absent. The prostatic duct is however to be seen as a swollen tube showing an inverted S-shaped curve in segment xviii, when prostates are absent, the prostatic duct is then in continuation of the *vasa deferentia* on each side.

Female organs.—A large *receptacula ovorum* is present as a bulging from septum $\frac{13}{14}$ on each side.

Spermathecæ.—Four pairs in segments vi—ix. The ampulla is shield-shaped, in outline and well marked off from the duct which is slightly shorter than the ampulla. The diverticulum is long, swollen into a knob-like dilatation. (Fig. VII, Plate II.)

Lampito mauritii (Kinb.).

Only one partially dissected specimen in spirit from the new Shalimar side and four specimens from Kapurthala. All these specimens were in the collection of my worthy professor and patron Lt.-Col. J. Stephenson, D.SC., I.M.S., through whose very great kindness I had an occasion of examining this interesting form. I am also indebted to him for allowing me to use his manuscript, notes on the external characters of the Lahore form in order to complete my account of the same.

External characters—

Length.—$8\frac{1}{2}$ inches, diameter 5 mm., segments 166.

Colour.—Dark yellow, darker purplish tinge at the anterior end.

Prostomium prolobous in the Lahore form while *Epilobous* in the specimens from Kapurthala.

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First five segments consist of single annuli while segments vi and vii of two annuli each, and rest of the precliteller segments of three each; no distinct secondary annulation behind the clitellum.

Setæ are in a chain which is interrupted ventrally but there is no dorsal break, usually $zz=yz$ sometimes a little more than yz.

$$aa=2\tfrac{1}{2}-3ab>bc>cd.$$

Seta a is especially enlarged and the line of setæ aa in all the preclitellar segments is nearly straight.

The numbers of the setæ are as follows :—$\frac{38}{vi}$ $\frac{44}{x}$ $\frac{34}{xxi}$ and 33 in the middle part of the body.

First dorsal pore in the intersegmental furrow $\frac{10}{11}$.

Clitellum extends over xiv—xvii (=4 segments). Setæ are present on the clitellar segments.

The *male apertures* are situated on large rounded papillæ on segment xviii, these in turn are overhung by large glandular areas which take up the whole length of the segment and encroach a little on segment xix also. The interval between the male pores is nearly $\frac{1}{4}$ u, there are no setæ between the male pores (Fig. 6, Plate 1).

Female pore could not be distinguished.

No spermathecal apertures are visible and there are no other genital marks of any kind.

Internal anatomy.—Septum $\frac{5}{6}$ very thin and delicate, $\frac{6}{7}$ rather thin and the septa $\frac{7}{8}$—$\frac{12}{13}$ thick and muscular, $\frac{13}{14}$ and onwards thin but very definite.

The *Gizzard* is in segment v. Michælsen in his "*Oligochæta*" (1) in the "*Tierrich*" says that it lies in segment vi, while in his "*Indian oligochæta*" (2) he says it lies in v (vi?). The difference is probably due to the earlier observers having not distinctly seen the thin and delicate septum $\frac{5}{6}$.

There are no calciferous glands nor any intestinal diverticula.

There are five pairs of hearts in segments ix—xiii.

Excretory system.—Both *micro* and *meganephridia* are to be seen in this form. The *micronephridia* are seen as conspicuous masses lying on the sides of the intestine from segments xv onwards, but they occur in the more anterior segments also where they are nearer the midventral line and are hidden by the cone within cone arrangement of the septa themselves.

The *meganephridia* begin about segment xx and appear to be due to the increased development of one of the tubule in the micronephric mass. They are small at first but about the xxx segment where they reach their full size they are as very conspicuous tubes one on each side of the intestine lying between the micronephric mass.

Reproductive organs are lodged in segments ix—xix.

Male organs.—The *testes* and *seminal funnels* are free in segments x and xi. The paired seminal vesicles lie in segments ix—xii. They are irregularly cut up into small lobes. There are no median seminal vesicles. The *prostates* are rather thick of an opaque white color lying in segments xviii and xix, the prostatic duct is thick and shows an S-shaped curve.

The *penial setæ* are slightly curved at the end, the free end is slightly bifid. Round the distal portion of the shaft there are a number of prominent spines arranged in rather irregular rows on the shaft. (Fig. 15, Plate I).

Female organs.—The ovarian funnels as well as ovaries lie in segment xiii, the oviduct is xiv, hence the female opening externally would be on segment xiv.

The *spermathecæ* are three pairs lying in segments vii—ix, hence they would open externally in the intersegmental furrow $\frac{6}{7}$—$\frac{8}{9}$. The ampulla is elongated with a constriction in the middle, it gradually narrows towards

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the external opening, the duct being not distinctly marked off. From close to the base arise two club-shaped diverticula, one on each side $\frac{1}{3}$ as long as the ampulla (Fig. VIII, Plate II.)

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6. *Stephenson, J.*—"Zoological Results of the Abor Expedition," Rec. Ind. Mus., Calcutta, Vol. VIII, Part IV, No. 29, 1914.
7. *Stephenson, J.*—"On a Collection of Oligochæta mainly from Northern India." Rec. Ind. Mus., Vol. X, Part VI, No. 22, 1914.

Explanation of Plate I.

Figure 1.—Genital area of *Pheretima heterochæta.* ♀ Female pore, ♂ Male pore.

Figure 2.—Genital area of *Pheretima posthuma.* G. Genital papilla. ♀ Female pore, ♂ Male aperture.

Figure 3.—Genital area of *Pheretima barbadensis.* ♀ Female pore. Cl. Clitellum, ♂ Male aperture. G. Genital papilla.

Figure 4.—Genital area of *Pheretima hawayana.* Setæ on the segment xvi indicated where they are present ventrally. ♀ Female pore, G. Genital papilla. ♂ Male pore.

Figure 5.—Clitellum of *Helodrilus caliginosus* forma *trapezoides.* S. setæ. C. Cushion formed by the genital area.

Figure 6.—Segments xviii—xx of *Lampito mauritii.* ♂ Male pore.

Figure 7.—Cocoon of *Pheretima posthuma.*

Figure 8.—Clitellum of *Helodrilus parvus* ventral view. S. Setæ. G. Genital papillæ.

Figure 9.—Segments xiv—xvi of *Helodrilus caliginosus.* ♀ Female pore, ♂ Male aperture.

Figure 10.—Segments ix—xi of *Helodrilus caliginosus.* G. Genital areas of a glandular nature surrounding the setæ.

Figure 11.—Seta *a*, segment, x, *Helodrilus caliginosus.*

Figure 12.—Seta *a*, hinder part of the body, *Helodrilus caliginosus.*

Figure 13.—Seta *a*, segment x, *Helodrilus parvus.*

Figure 14.—Seta of *Pheretima heterochæta.*

Figure 15.—Distal end of penial seta of *Lampito mauritii* showing ornamentation.

Roman numerals refer to the numbers of segments.

Explanation of Plate II.

Figure I.—*Helodrilus caliginosus* forma *trapezoides* spermatheca.

Figure II.—*Helodrilus parvus*—Cocoon.

Figure III.—*Pheretima hawayana* sub. sp. *typica.* Segments xi-xxiii dissected out to display the internal anatomy.

Figure IV.—*Pheretima hawayana* sub. sp. *typica* spermatheca.

Figure V.—*Pheretima hawayana* sub. sp. *barbadensis* spermatheca.

Figure VI.—*Pheretima posthuma*—Spermatheca.

Figure VII.—*Pheretima heterochæta*—Spermatheca.

Figure VIII.—*Lampito mauritii*—Spermatheca.

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THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED.

BY

E. BLATTER, S.J.

PART XVI.

(*With Plates—LXXXIV—LXXXVIII.*)

(*Continued from page 340 of this Volume.*)

7. *COCOINEÆ.*

Upper spathe of spadix complete, opening on the ventral side at the time of flowering, persistent (in *Elaeis* opening irregularly and caducous); lower one short or rudimentary. Ovary of 3 united carpels (of 3-6 in *Orbignya* and others); each carpel having at its base a seed deeply embedded in the central placenta; the loculi disappear in the fleshy mass of the carpels. Drupe of 3 (-6) strongly united carpels; remains of the stigma apical. Stone 1, formed by 3 syncarpous carpels, mostly with 1 seed (rarely 2 or 3-6). Seed with a rough testa, mostly with a raphe distinctly ascending on the inner side.—Leaves paripinnate; leaflets reduplicate.

DISTRIBUTION :—America between 25° N. L. and 35° S. L. One species of *Elaeis* and one of *Cocos* have a wider distribution.

a. Sub-tribe : ELAEIDEÆ.

Spadix branched. Flowers solitary, or male flowers in pairs included in deep cavities of the stout branches. Male flowers with the stamens united. Calyx and corolla of the female flowers of about the same length, imbricate; endocarp with 3 pits situated in the upper half or near the apex; radicle of the embryo obliquely ascending.

Barcella, Trl., *Elaeis*, Jacq.

One species of Elaeis is cultivated in India.

ELAEIS, Jacq. Stirp. Amer., 280. t. 172.—Benth. et Hook. f. Gen. Pl. III, 944.—H. B. et K. Nov. Gen. et Sp. I, 306 (Alfonsia).

Stem unbranched, erect or decumbent, annulate, clothed with old petiole-bases. Leaves many in a terminal crown, large, pinnate; petiole short, thick, spiny on the margins or unarmed, with a short open sheathing base; leaflets ensiform, acuminate, recurved at the base.

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Spadices interfoliaceous, short, thick, peduncle loosely clothed with acute bracts; branches dense, male terminating in a spine, female more robust; spathes 2, complete, at length breaking up into fibres; male bracts very densely imbricate, connate into cupules; male bracteoles scale-like; female bracts large, lanceolate, spinescent, overtopping the flowers; female bracteoles like the sepals. Male flowers: Sepals linear or lanceolate, concave, imbricate. Petals smaller and thinner than the sepals, valvate. Stamens 6; filaments connate into a thick fleshy cylindrical tube below, free and reflexo-patent at the apex; anthers linear-oblong, bilobed at the base, exserted, basifixed. Rudiment of ovary minute. Female flowers much larger than the male, ovoid, sepals ovate, imbricate at the base. Petals a little longer than the sepals, erect, convolute imbricate, entire or split at the apex. Disk annular, Ovary ovoid or subcylindrical, 3-celled or by abortion 1-2-celled; style thick, pyramidal: stigmas large, linear, revolute; ovule filling up the cell; micropyle subapical.

Fruit ovoid or obovoid, 1-3-seeded, intruded at the base; umbilicate at the apex, stigmas terminal; pericarp spongy and oily, fibrous inside; endocarp thick, long, with 3 pores above the middle. Seed adnate just below the centre of the cell: testa thin; raphe reticulately branched; albumen cartilaginous, homogeneous, hollow; embryo opposite a pore of the endocarp.

Species about 4. Tropical Africa and Eastern Tropical South America.

ELAEIS GUINEENSIS, Jacq. Stirp. Amer. 280, t. 172, ed. pict. 136, t. 25f.—Mart. Hist. Nat. Palm. II, 62, t. 54 et 56; Münch. gel. Anzeig. 1838, 639, 1839, 46.—R. Br. Vermischt. Schrift. I, 269.—Schum. & Thonn., Beskr. Guin. Pl. 439.—Tuckey, River Congo 455.—Hook. Niger Fl. 13, 526. —Mann. and Wendl. in Trans. Linn. Soc. XXIV, 424, 439.—Kirk in Journ. Linn. Soc. IX, 231.—Schweinf. Beitr. Fl. Aethiop. 291.—Guessfeldt and Pechuel—Loesche, Loango—Exped. I, 56, with fig., 208, 224 with fig.: —J. Braun in Mitth. Deutsch. Schutzgeb. II (1889), 148.—Engl. Pfl. Ost. Afr. B. 8, C. 131.—Drude in Engl. Jahrb. XXI, 112.—Henriques in Bolet. Soc. Brot. V, 206, 218.—Durand & Schinz, Conspect. Fl. Afr. V. 462, and Etudes Fl. Congo I (274).—*E. Guineensis var. macrosperma*, Welw. Apont. 584.—Rendle in Cat. Afr. Pl. Welw. II. 84.

NAMES: OF THE TREE:

English: Oil palm, African oil palm, true oil palm.

French: Aouara d'Afrique, aouara des Caraïbes, a. de Guinée, arouara des Caraïbes, avoira de Guinée, élaïs de Guinée, éléide, éléide de Guinée, noix de palme, noix de palmier, palmier crocro, palmier épineux, palmier à huile, palmiste épineux.

German: Oelpalme, Afrikanische Oelpalme, Guineische Palme.

Dutch: Afrikaansche awarra, Afrikaansche oliepalm, obepalm, oliepalm van Guinea, oliepalm van West Afrika, oliepalm van de kust van Guinea, palmietboom.

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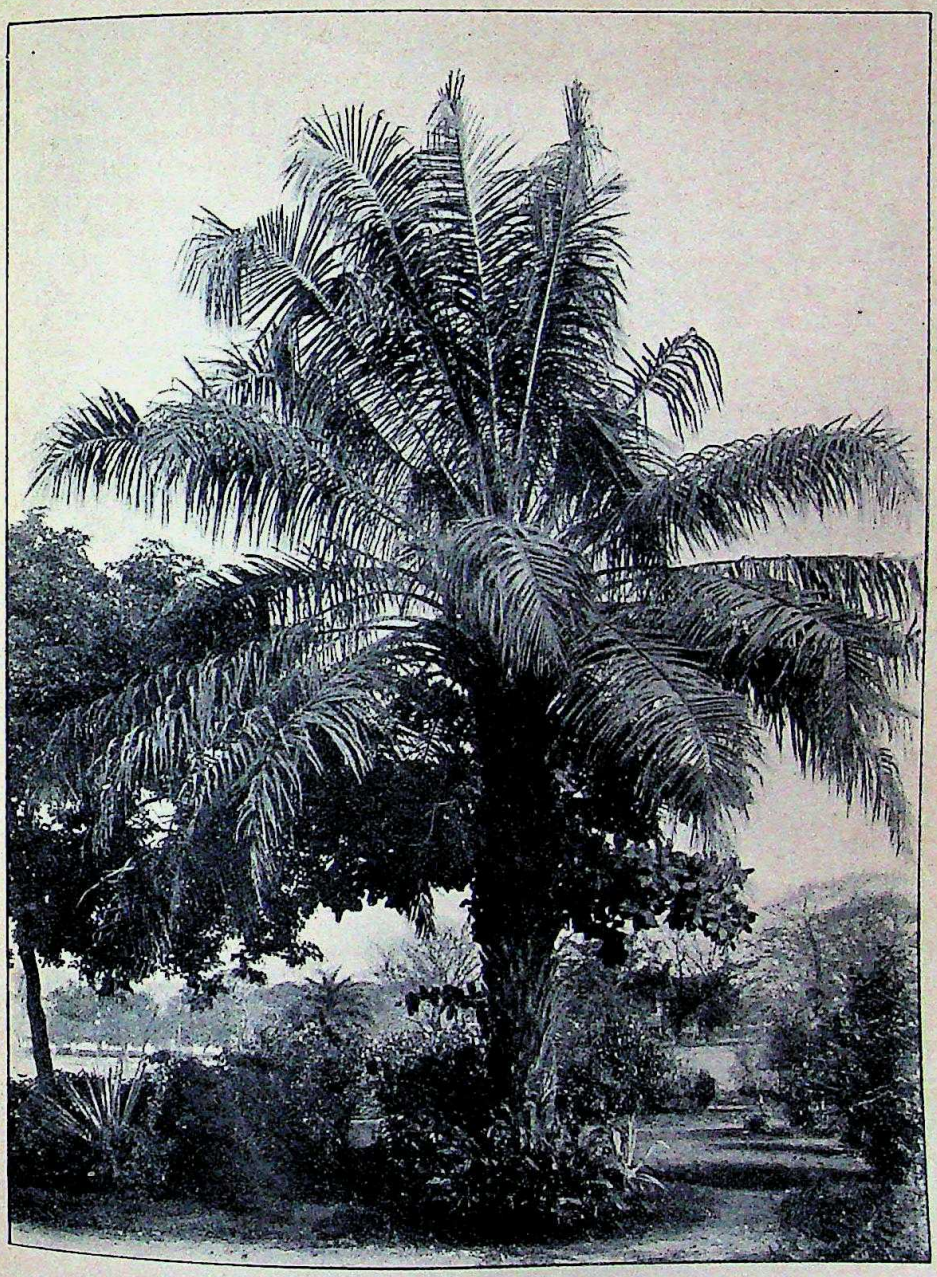

OIL PALM (*Elæis guineensis*, Jacq.)

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In Guinea: Toehn—Tis.
In Angola: Dihoho.
In the Island of St. Thomas: Denden or Palmeira Andim.
In Surinam: Aaavora, avuara, avoora, avouara, maba, obé.

OF THE YELLOW FAT OIL FROM THE SARCOCARP:

Latin: Butyrum palmæ, Oleum elaeidis, oleum expressum palmæ, oleum palmæ.
English: Macaw fat, palm oil.
French: Beurre de palme, beurre de palmier, beurre de Galam, graisse d'Ashantis, huile de palme, huile de palmier, huile de Sénégal, pumicin.
German: Palmbutter, Palmfett, Palmoel.
Dutch: Afrikaansche palmolie, olie van Senegal, palmboomolie palmolie, palmvet.

OF A WHITE FAT OIL MADE FROM THE KERNELS:

English: Palm kernel oil, palm seed oil.
French: Beurre de Galaham, huile de palmiste, huile de pepin de palme.
German: Galahambutter, Palmkernenoel.
Dutch: Palmpittenvet, palmkernvet.

DESCRIPTION:—Stem robust, 20-50 feet high, sometimes reaching 85 feet, always quite straight, usually $\frac{2}{3}$-1 foot in diameter, and about $3\frac{1}{3}$ feet just above the ground, annulate, bearing the remains of old leaves when young, never soboliferous. Leaves show their normal dimensions only after 6 or 8 years. Leaves on adult palm 20-40, forming a terminal crown, 10-17 feet long. Leaflets 100-160 pairs, lanceolate-linear, those in the middle of the leaves 2-4 feet long and $1\frac{1}{2}$-2 inches wide, those on the lower third $1\frac{2}{3}$-$2\frac{1}{3}$ feet long and $\frac{2}{3}$-1 inch wide. Petiole robust, 7-4 feet long, $\frac{1}{3}$-$\frac{2}{3}$ foot broad, suddenly broadened at the base, convex and often white tomentose below, yellowish green, spiny on the margins, spines 50-60 pairs.

Spadices interfoliar, arising below the terminal bud sometimes to the number of 6 or 8 at the same time, the male ones always preceding the female by several weeks or even months; peduncle robust, compressed, $\frac{1}{4}$-$\frac{2}{3}$ feet long, $1\frac{1}{2}$-2 inches broad and $\frac{3}{5}$ inch thick, spathe $\frac{1}{3}$-1 foot fong, $\frac{1}{5}$-$\frac{1}{4}$ foot broad, coriacious floccose-tomentose on the outer surface. Male spadix: Flowering part forming an ovoid mass, rarely oblong or subspherical-compressed, $\frac{1}{2}$-$\frac{5}{6}$ foot long, 5-7 inches broad and $\frac{1}{5}$-$\frac{1}{3}$ foot thick, with many branches bearing densely imbricate flowers. Branches brown cylindric, subtriquetrous or flattened by mutual compression; $\frac{1}{3}$-$\frac{1}{2}$ foot long. Flowers very numerous, densely arranged in 20 longitudinal lines at least in the upper part. Sepals 3, free to the base, oblong, obtuse, greyish,

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scarious. Petals of the same size and shape as the sepals. Stamens 6; filaments short, united at the base; anthers sagitatte. Rudimentary ovary reduced to a whitish protruberance. Female spadix: Peduncle shorter than in the male, inflorescence more massive than in the female and sometimes more spherical, though slightly compressed, $\frac{1}{2}$-$1\frac{1}{6}$ foot long, $\frac{1}{3}$-$\frac{1}{2}$ foot broad; branches about 100-150, each bearing 6-40 flowers, usually 8-12. Flowers much larger than in the male; bract 1, whitish-yellow or greenish, lanceolate-subulate, about $\frac{1}{8}$ inch long and terminated by a spine which reaches beyond the flower; bracteoles small, ovate or ovate-oblong, shorter than the sepals. Sepals 3, oblong, $\frac{2}{5}$-$\frac{3}{5}$ inch long, scarious, subobtuse and often laciniate at the top. Petals 3, of the same shape as the sepals, of the same length or slightly longer; annular disk truncate or very slightly dentate. No rudimentary stamens. Ovary ovoid-cylindric, $\frac{1}{4}$ inch long, about $\frac{1}{6}$ inch in diameter, 1-locular (or exceptionally 2-3-locular); style whitish, about $\frac{1}{8}$ inch long, of almost the same diameter as the ovary; stigmas 3, rarely 4, ovule 1 in each loculus, inserted at the base, filling the whole cavity.

Fruiting spadix $\frac{1}{3}$-$1\frac{1}{3}$ feet long, $\frac{1}{3}$-$1\frac{1}{6}$ feet broad. During the ripening of the fruits the terminal spines of the branches and bracts become longer. Fruit sessile, enclosed in the dry perianth, ovoid, attenuate and then suddenly truncate at the apex, with the dry style often persistent, red passing into orange, or almost orange or vermillion red, or sometimes black in the upper half, and whitish yellow in the lower. Size variable according to the variety of the plant, reaching $\frac{1}{12}$-$\frac{1}{4}$ inch in length by $\frac{1}{12}$—about $\frac{1}{8}$ in diameter. Seed occupying the whole cavity of the endocarp.

HABITAT.—The geographical limits of the Oil Palm in W. Africa are in the north the Senegal River (16° N. L.), in the south the districts Loanda and Benguela in the Portuguese Congo. Eastwards it stretches from the west coast right across Africa. In Central Africa it has not been observed beyond 18°45′ N. L.

HISTORY.—De Candolle writes about this palm: "Travellers who visited the coast of Guinea in the first half of the sixteenth century already noticed this palm, from which the Negroes extracted oil by pressing the fleshy part of the fruit. The tree is indigenous on all that coast. It is also planted, and the exportation of palm-oil is the object of an extensive trade. As it is also found wild in Brazil and perhaps in Guinea, a doubt arose as to the true origin. It seems the more likely to be American that the only other species which with this one constitutes the genus *Elaeis* belongs to New Granada. Robert Brown, however, and the authors who have studied the family of palms, are unanimous in their belief that *Elaeis guineensis* was introduced into America by the Negroes and slave-traders in the traffic between the Guinea coast and coast of

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America. Many facts confirm this opinion. The first botanists, who visited Brazil, Piso and Marcgraf and others, do not mention the *Elaeis*. It is only found on the littoral, from Rio de Janeiro to the mouth of the Amazon, never in the interior. It is often cultivated, or has the appearance of a species escaped from the plantations. Sloane, who explored Jamaica in the seventeenth century, relates that this tree was introduced in his time into a plantation which he names, from the coast of Guinea. It has since become naturalized in some of the West India Islands." (Origin of Cultivated Plants, p 429.)

USES.—*Elaeis guineensis* is foremost among the useful palms of tropical Western Africa. The oil of the mesocarp of the fruit of this palm constitutes in most parts the chief food of the natives, who hardly ever take a meal in which it is not used in some way or other. It is nutritious and of an agreeable flavour—so much so, indeed, that it generally becomes a favourite dish with Europeans. Besides being used as food, the natives also use it for oiling their bodies, partly to keep away insects, and partly as a substitute for clothing. The Bubis of the Island of Fernando Po make an excellent poultice of it which they apply to wounds; they used it especially when the hand of any person, found guilty of adultery, had, in accordance with the usage of these people, been cut off. Among the more civilized natives it is used, as in Europe, in the manufacture of soap, it is also employed for lighting their huts, but the oil extracted from the kernel of the nut is generally preferred for this purpose. The exportation of the fruit of this palm has attained great dimensions.

The toddy of this palm, a drink much liked by the natives, is obtained by cutting off the male flower-spike; this wine is also used by the Europeans instead of yeast in making bread. Besides the oil, the Africans prepare from *Elaeis guineensis* palm-soup, a dish, when made of boiled palm-nuts only, is very well flavoured. The natives pick the nuts of those young trunks which have not yet lost any of their leaves, and consider them as superior to the fruit of older plants.

The main nerves of the leaf and the exterior of the petiole are used for basket-work, for the making of brooms, and similar purposes. The fibre at the base of the leaves, and also that of the spathe, is used for stuffing cushions, etc. The soft centre of the upper parts of the stem, consisting of the undeveloped leaves, is much relished as a vegetable. Finger-rings, bracelets, necklaces, and other ornaments are cut from the endocarp of the seed.

CULTIVATION IN EUROPE.—Stove palms. They thrive well in a rich sandy loam. Propagation by seeds. They form excellent decorative plants when in a young state.

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List of Synonyms, excluded species, and species of which the name alone is known: (1)

Elaeis Dybowskii Hua in Bull. du Muséum I (1895) 315=E. guineensis, Jacq. var. idolatrica Aug. Chev.

E. macrosperma Welw., Apontamentos p. 584=E. guineensis var. communis dura, Becc ?

E. microsperma Welw., Apontamentos p. 584=E. guineensis var. communis tenera, Becc ?

E. montana Page ex Steud. Nom. ed. 2, I, 545.—Jamaica. Quid ?

E. nigrescens Aug. Chev. Docum. 46 (subsp.). Comprises several varieties of E. guineensis, Jacq.

E. occidentalis Sw. Fl. Ind. Occ. I, 619=Calyptrogyne Schwartzii, Becc. in Pomono Coll. Journ. II (Dec. 1912) 356.

E. odora Trail in Journ. Bot. XV (1877) 81=Barcella odora Trail.

E. Pernambucana Lodd. ex G. Don in Loud. Hort. Brit. 399.—Brazil (ex Ind. Kew.)—Quid?

E. spectabilis Lodd. ex Sweet Hort. Brit. ed. 3, p. 716.—Ind. Orient. (ex Ind. Kew.)—Quid ?

E. virescens Aug. Chev. Docum. 60 (subsp.). Comprises several varieties of Elaeis guineensis.

For the convenience of those who are interested in this palm and wish to have fuller information on its economic aspects and its cultivation, we append a list of the more important publications on *Elaeis guineensis*:

Adam, J. Le Palmier à huile en Afrique occidentale française. Paris, 1909.

Almeda, J. J. de. Noticia sobre a Palmeira de Dendem. Lisbon, 1906.

Anonymus. The varieties of the Oil Palm in West Africa, Kew Bull. (1909), No. 2.

Beccari, O. Contributo alla conoscenza della Palma a Olio. Estratto da 'L' Agricultura Coloniale,' Anno VIII, 1914.

Chevalier, A. Documents sur le Palmier à Huile. In A. Chevalier, Les Végétaux Utiles de l'Afrique trop. Française. Paris, 1910.

Daniel, J. Le Palmier à huile au Dahomey. Revue Colon. 1902.

Drabble, E. Comparison of Palm Fruits from the West Coast. In Quarterly Journ., Liverpool Univ., Instit. of Commerc. Research in the tropics II (Sept. 1907), No. 5.

Drabble, E. Note on the cultivation of the Oil Palm. Ibid. III (Jan. 1908), No. 6.

(1) Beccari, O. Contributo alla conoscenza della Palma aOlio.In L'Agric. Col. Anno VIII (1914), p. 76.

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Fendler, G. Zur Kenntnis der Früchte von *Elaeis guineensis* und der darans gewonnenen Oele. Berichte d. Deutsch. Pharmaceut. Ges. (1903), No. 4.

Gruner, H. Die Oelpalme im Bezirk Misahohe. Tropenpflanzer (1904) 283.

Preuss, P. Die wirtschaftliche Bedeutung der Oelpalme. Tropenpflanzer (1902) 450.

Thompson, H. N. Notes on the Oil Palm. Suppl. to the Government Gaz. Southern Nigeria. Lagos (5th Feb. 1908), No. 10.

ILLUSTRATION.—The specimen figured on Pl. LXXXIV was taken by Mr. Phipson in the Victoria Gardens, Bombay. Some fine specimens may be seen on Pl. I of our series.

b. Sub-tribe: ATTALEEÆ.

Spadix much branched, or little, or not at all; upper spathe complete, woody and persistent. Male and female flowers forming 3-flowered clusters at the base of the branches. The upper part of the branches or, besides, special spadices only male. Stamens of the male flowers free or united at the base. Calyx and corolla of the female flowers of 3 leaves, broadly imbricate, convolute. Endocarp with 3 (-6) pits situated in the lower half. Radicle of embryo obliquely descending.—Unarmed; spathe sometimes densely woolly.

Orbignya, Mart., *Attalea*, H. B. Kth., *Maximiliana* Karst., *Cocos*, L., *Diplothemium*, Mart., *Jubæa*, Gay.

KEY TO THE GENERA DESCRIBED BELOW.

I. Putamen acute at base:
  A. Male spadix mixed with androgynous flowers:
    (1) Male petals reaching far beyond the stamens ... ... Attalea.
    (2) Male stamens protruding beyond the petals ... ... Maximiliana.
  B. All the spadices with clusters of 3 flowers or a few female flowers at the base of the branche whose upper part bears only males ... ... Cocos.
II. Putamen not acute at base ... ... Jubaea.

ATTALEA, H. Bpld. & Kth. Nov. Gen. Spec. I. 309, t. 95, 96.

(After "Attaleia" the name of several Greek towns, which were called so in honour of Attalus I., King of Pergamum, 241-197 B.C.)

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Kunth Enum. Pl. III. 275.—Karst. Linn. 28, 255, 273.—Mart. Hist. Nat. Palm. II. 135, t. 41, 75, 95-97; III. 296, 325, t. 167-169.—Oerst. Palm. Centro-Amer. 1858, 49.—Griseb. Fl. Brit. W. Ind. 522.—Wallace Palm. Amaz. 116, t. 3 fig. 1, 46.—B. Rodr. Enum. Palm. Nov. 42.—Drude in Fl. Brasil. III. II. 434.—Benth. & Hook. Gen. Pl. III. II. 947, 130.

Stems generally lofty, cylindrical, smooth, irregularly annulate; some species stemless. Leaves large, regularly, pinnate; petioles with the margins of the sheathing bases more or less fibrous.

Spadix arising from among the lower leaves; spathes double, the interior one complete and woody. Flowers monœcious or diœcious, yellowish-white. Male flowers: sepals 3, free, or coherent at the base; petals membranous or fleshy, lanceolate, erect. Stamens 6-24; pistillode small. Female flowers: sepals and petals 3, ovate; ovary egg-shaped; style short; stigmas 3; staminodes forming a ring

Fruit large, ovate or oblong, with a dry fibrous outer covering, red or greenish brown. Seeds usually 3, sometimes 4 or 5. Albumen cartilaginous, equable, mostly solid. Embryo basilar.

Species about 23.

DISTRIBUTION.—In various parts of South America, especially in the vicinity of the Amazon and its tributaries, from the level of the sea to a height of 4,000 feet above it.

CULTIVATION IN EUROPE.—Handsome stove palms. They grow well in a compost of peat and loam in equal quantities and require a liberal supply of water; summer temperature from 65°-80°, winter temperature from 55°-60°.

ATTALEA COHUNE, Mart. Hist. Nat. Palm. III, 300, t. 167, f. 4. —Walp. Ann. I, 1008.—Oerst. in Vidensk. Meddel. 1858, 50; Seem. Bot. Voy. Herald, p. 204.—Godm. & Sal. Biol. Centr.—Amer. III, 415.

NAMES: OF THE TREE:

English: Cohune palm, Cohune tree.
German: Cohunepalme.
French: Cohune (de la Guyane).
In Panama: Palma real, Corozo gallinazo.

OF THE NUT:

English: Cohune nut.
German: Cohunenuss.

OF THE OIL:

English: Cohune oil.
German: Cohuneoel.
French: Huile de cohune.
Dutch: Cohuneolie, palmolie.

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DESCRIPTION.—Resembles in appearance the Coco-nut Palm, but is not nearly so high as that tree, and the trunk is considerably thicker. Stem unarmed. Leaves erect, ultimately spreading, pinnate, furnished with 3-4 dozen dark green leaflets, sometimes 18 inches in length; petioles rounded, and dark brown below, flat and green on the upper side.

Fruit about the size of a large hen's egg, growing in clusters, each cluster resembling a bunch of grapes. Nut ovoid, 2½ inches long, 1½ inches broad, shortly beaked at the top (beak compressed-conical, 4 lines long), brown, roughish; putamen 3-celled; seeds 2 or 3, oblong, 16 lines long, 7 lines broad, obtuse at both ends.

HABITAT.—Honduras, Panama.—Grown in Indian gardens.

USES.—In the Province of Panama wine is prepared from the trunk. The unexpanded segments are used for wrapping up cakes of Indian corn (tortillas) previous to boiling them in water. The expanded leaves serve as thatch, and are employed in the religious ceremonies of Palm Sunday. From the fruit an oil is extracted. (Seeman).

ATTALEA SPECIOSA, Mart. Palm. Brasil. 138, t. 96, f. III, 3, 4, 5, 6 (subnomine *A. Excelsa*); Hist. Nat. Palm. III, 298, t. 169, f. IV; Palmet. Orbig. 117; Wallace, Palmtrees Amaz. 117, t. 46; Drude in Fl. Brasil. III, II, 443.

NAMES.—Uauassu Palm (English); Uauassupalme (German). The vernacular Uauassu means "large fruit."

DESCRIPTION.—Stem 50-70 feet high, straight, cylindrical, and nearly smooth. Leaves large, terminal, regularly pinnate, 15-20 forming a dense crown, the outer ones patent. Segments elongate, rigid, closely set together, spreading out flat on each side of the midrib, the uppermost deflexed. The sheathing bases of the petioles are persistent for a greater or less distance down the stem, and in young trees down to the ground.

Spadices growing from among the leaves, large, simply branched.

Drupe large, about 3-4 inches long, 2 inches in diameter, supported by the persistent perianth, slowly conical-narrowed towards the apex, fuscous, the epidermis clothed with a dense ferruginous tomentum. The foramina of the putamen ⅔th inch from the base, hidden in the fibres of the mesocarp; fibres within the putamen solitary, included, densely scattered, running longitudinally. Seeds very narrowly oblong, 2½-3 inches long.

HABITAT.—Brazil, Guiana. . . . . Cultivated in India.

USES.—The foliage is very extensively used for thatching. The young plants produce very large leaves before the stem is formed and it is in this state that they are generally used. The unopened leaves from the centre are preferred as, though they require some preparation, they produce a more uniform thatch. The leaf is shaken till it falls partially open, and then each leaflet is torn at

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the base so as to remain hanging by its midrib only, which is however quite sufficient to secure it firmly. They thus hang all at right angles to the midrib of the leaf, which admits of their being laid in a very regular manner on the rafters. They are generally known as "palha branca" or "white thatch," from the pale yellow colour of the unopened leaves, and are considered the best covering for houses in places where Bussu (Manicaria saccifera Gaertn.) cannot be obtained.

ILLUSTRATION.—Pl. LXXXV. Mr. Macmillan was kind enough to take a photograph of the Uauassu Palm in the Botanic Gardens of Peradeniya.

MAXIMILIANA, Mart. Hist. Nat. Palm. I, 131, sp. 1, t. 91-93; III, 295 et Palmet. Orbig. 109 et 113 (Adonot).

(After Maximilian Joseph, I, King of Bavaria, 1756-1825.)

Kunth Enum. Pl. III, 291, sp. 1.—Griseb. Fl. Brit. W. Ind., 522.—B. Rodr. Enum. Palm., 41.—Spruce, Journ. Lin. Soc. XI, 162.—Wallace Palm. Amaz. 120, t. 3, fig. 2, 3, t. 47.—Drude Fl. Brasil., III, II, 450, t. 104.—Benth. & Hook. Gen. Pl., III, II, 946, 128.—*Scheelea* Karst. (pro altera parte!) in Linnæa, XXVIII (1856), 264.

Stems of these magnificent palms are tall, erect, and smooth. Leaves very large, irregularly pinnate. Bases of the petioles persistent, often covering the stem down to the ground.

Spadices growing from among the lower leaves, simply branched. Some spadices with only male flowers, others with male and female flowers on the same tree. Spathes large, complete, woody. Male flowers with 6 stamens and a minute pistillode. Female flowers with a short style and 3 stigmas, the staminodes forming a membranous cup.

Fruit ovate, yellow, with a woody, almost fleshy pericarp, 1-3-seeded.

Species about 4.—In tropical Brazil, Guyana, Venezuela, Columbia, Bolivia.

CULTIVATION IN EUROPE.—Handsome decorative stove palms. They thrive in a compost of two parts rich loam, one part peat, and one of sand. During the growing period, water must be given liberally, the quantity of which should be gradually diminished as winter approaches.

MAXIMILIANA REGIA, Mart. Palm. Brasil. 132, t. 91, 92, 93; Hist. Nat. Palm. III, 296; Palmet. Orbig. 110, t. 15 et 31, f. A; (*Exclusa M. Regia* Wallace, Palmtrees Amaz. 121, t. 47 et 3 = *M. Maripa* Dr. ?); Drude in Fl. Brasil. III, II, 454.—*Maximiliana Martiana* Krst. in Linnæa XXVIII (1856) 279.

NAMES.—Anaja Palm (English); Anajapalme (German); Inaja or Anja (in Brazil).

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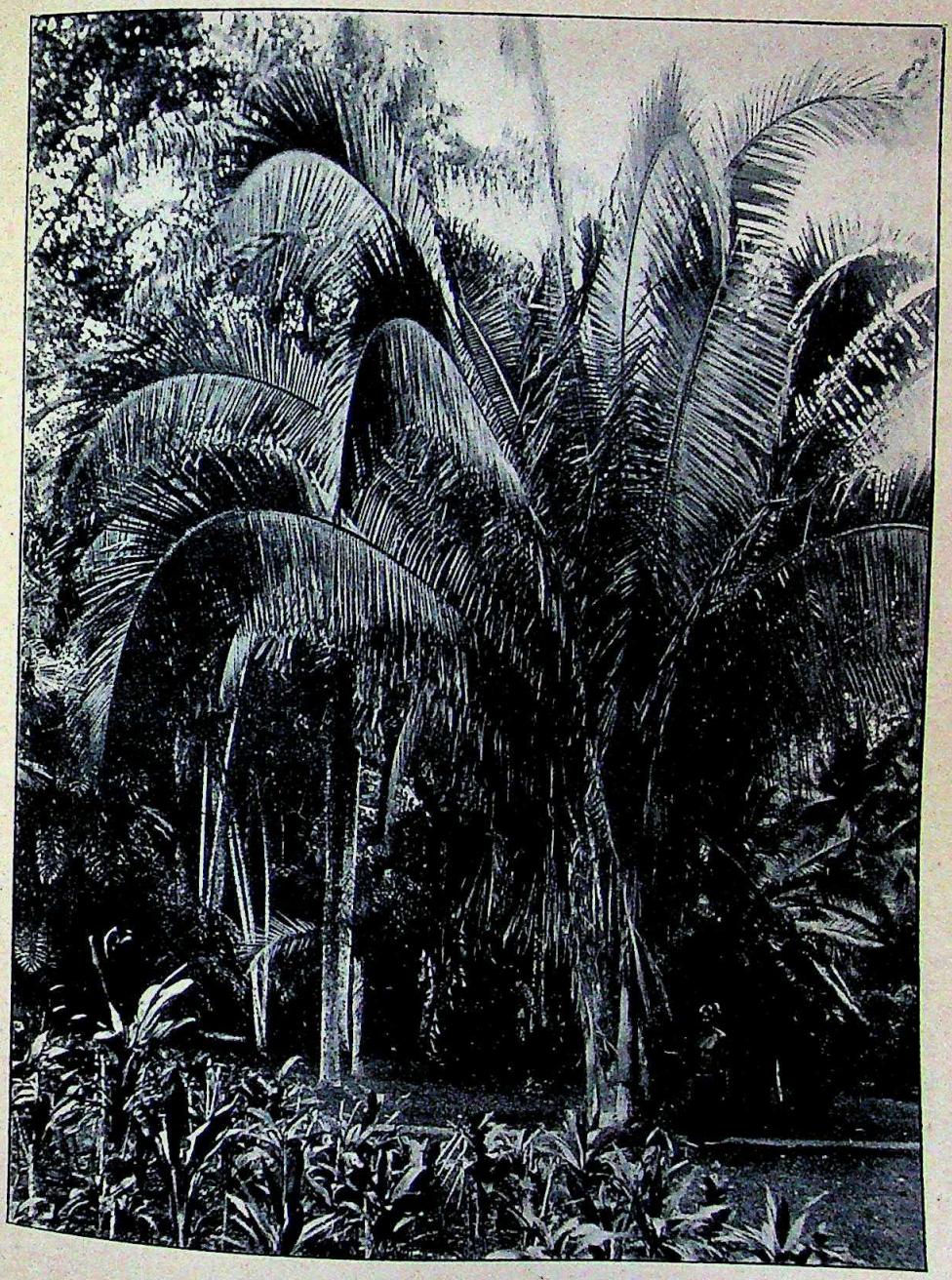

UAUASSU PALM (*Attalea speciosa*, Mart.)

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DESCRIPTION.—Stem lofty, massive, smooth, obscurely annulate, 15-25 feet high, 1-1$\frac{2}{3}$ foot in diameter at the base, in the upper part about thrice as thick on account of the persistent petioles. Leaves 15-30, densely arranged, over 15 feet long; linear-lanceolate in outline; segments thinly papyraceous, oblanceolate, obtuse, or rotundate-acuminate, the upper ones 1 foot long and 1 inch broad, arranged in groups of 3, 4, 5 or 6, at intervals along the midrib, from which they stand out in different directions, very long and drooping.

Spadices numerous, growing from the bases of the lower leaves, simply branched and very densely clustered, 2 feet and more long; spathes large, spindel-shaped, ventricose, woody, the upper one produced into a long beak which reaches almost 6 inches. Branches of spadix numerous, male ones $\frac{1}{3}$-$\frac{2}{3}$ foot long, densely covered with flowers about 1-1$\frac{1}{2}$ inch above the base, androgynous ones stouter, 2-3 inches long, developing above the base 1-3 (rarely more) female flowers and then ending in a short male spike. Male flowers $\frac{2}{5}$-$\frac{1}{2}$ inch long, calyx $\frac{1}{24}$ inch long, triphyllous; corolla $\frac{1}{8}$ inch long, infundibuliform. Stamens 6, exserted; anthers more or less $\frac{1}{3}$ inch long. Female flowers more than $\frac{2}{5}$ inch long; calyx firmly convolute; corolla included in the calyx.

Drupe about 1$\frac{3}{5}$ inch long, elongate, beaked, with a tough brown outer skin, beneath which is a layer of soft fleshy pulp of an agreeable subacid flavour, covering a hard stony seed; putamen sometimes ovoid-oblong acuminate, usually acute at both ends.

HABITAT.—Brazil, Guiana, Bolivia.

USES.—The terminal leaf-bud furnishes a most delicious cabbage. The great woody spathes form ready-made baskets used by the natives for carrying earth, clay, and sometimes for cradles; the hunters use them to cook meat in, as with water in them they stand the fire well. The fruits are often eaten.

COCOS, L.

Species about 30, all American, one of them cosmopolitan in the tropics.

(From Coco, the Portuguese for monkey; alluding to the end of the nut being like a monkey's head.)

CULTIVATION IN EUROPE.—Elegant stove palms. They grow well in a compost of two parts rich loam, one part peat, and one of sand. When growing they must be supplied with plenty of water; as winter approaches the quantity of water should be gradually diminished. They are not so well suited for subtropical gardening as many other genera of palms; but in a well-drained and sheltered spot, it is probable several of the species might prove satisfactory.

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Sub-genus I—EUCOCCUS, DRUDE.[1]

Tall, unarmed, monœcious, with smooth annulate stems. Leaves pinnatisect; leaflets narrow.

Spadix erect, at length drooping, simply panicled; branches bearing scattered female flowers, often between two males towards their bases and males above. Spathes 2 or more, lower short, upper fusiform or clavate; perianth coriaceous. Male flowers unsymmetric; sepals small, valvate; petals oblong, acute, valvate; stamens 6; filaments subulate; anthers linear, erect; pistillode minute or absent.

Female flowers much larger; globose; perianth greatly accrescent; sepals imbricate; petals shorter, convolute with imbricate tips; ovary 3-celled, usually 1-ovuled; style short, stigmas recurved; ovules subbasilar.

Fruit large, ovoid, terete or trigonous, 1-seeded; style terminal; pericarp thick, fibrous; endocarp bony, with 3 basal pores, the remains of the 3 cells; seed cohering with the endocarp; albumen hollow, equable, merely lining the endocarp with a thick hard coat; embryo opposite one pore.

Species 1, of American origin, but widely distributed throughout the tropics.

COCOS NUCIFERA, L. Fl. Zeyl. 392; Mart. Hist. Nat. Palm. II. 123 (*exl. descript. flor. masc. et fem.*) t. 62, 75 et t. 78 *tantum quoad* fig. V et VI, *excl.* fig. III, et IV, *et analys. omn*; Kunth Enum. III, 285: Roxb. Cor. Pl. I, 52, t. 73; Fl. Ind. III. 614; Thw. Enum. 330; Brandis For. Fl. 556; Kurz For. Fl. II, 540; Hook Fl. Brit. Ind. VI, 482 (with the above restrictions as to Martius); Brandis, Trees of India 648; Cooke Fl. Pres. Bomb. II, 812; Blume Rumph. III, 82-88; Miq. Fl. Ind. Bat. III, 64; Hook. Journ. Bot. II (1850), t. 1; Beccari, Malesia I, 85-86; Le Palme incluse nel genere Cocos 12; Hemsley Bot. in the Voyage of the Challenger, III, 103, 202, 249, 278, 297, 306, 809.—*C. nana*, Griff. Notul. II, 166—Rheede Hort. Mal. I, t. 1-4.

NAMES: OF THE TREE:

English: Coco Nut Palm, Coco Nut Tree, Cocoa Nut, Cocoa Nut Palm.

German: Kokospalme, Echte Kokospalme, Cocospalme, Cocosnussbaum, Kokospalmenbaum, Kokosbaum, Calappabaum, Calappusbaum, Indianischer Nussbaum, Kokosgalen, Wandernde Seeuferpalme.

Dutch: Kokospalm, Koko, kokosboom, kokosnootenboom, kokosnootpalm, klapperboom, klapperpalm, klapper, calappusboom, kalappus, cocos, cocosboom, cocospalm.

French: Cocotier, cocotier commun, cocotier des Indes, cocotier nucifère, cocotier ordinaire, cocotier porte-noix, palmier.

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(1) In the arrangement of the species of Cocos I follow O. Beccari; cf. his "Palme incluse nel genere Cocos" p. 8-9.

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GROVE OF COCO-NUT PALMS ON BOMBAY ISLAND (*Cocos nucifera*, L.).

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Hind: Narel, nariyal, nariel, nariyel, nariyal-ka-per.
Beng.: Narikel, nariyal, dab, narakel.
Guj.: Nariel, nariyela, nariera, naliyer, naryal, jhada, naryal.
Bomb.: Maar, naril, mahad, narel, naral-cha-jhada, mar, naural.
Mar.: Narela, narula, naralmad, mad, mada, mahad, varala, narel, narali-cha-jhada, naral, mar, tenginmar.
Tam.: Tenna, tenga, tennan-chedi, tenna-maram, tengay, taynga.
Duk.: Narel-ka-jhar, narel.
Tel.: Nari-kadam, tenkaia, kobbari, goburri-koya, tenkaya, kobri, chullu, kobbari chettu, tenkaya-chettu, erra-bondala, gujju-narchadam.
Kan.: Thenpinna, kinghenna, tengina, tengina-gida, tengina-kaya, tengina chippu, tenginay amne, tengmararu.
Mala.: Tenga, tenn-maram, tenna, nur, kalapa, nyor, kalambir.
Mysore.: Nur.
Sanscr.: Nari-kela, nari kera, nari keli, langalin.
Arab.; Jadhirdah, shajratun-narjil, shajratul-jouze-hindi, narjil, jouze-hindi.
Pers.: Darakhte-nargil, darakhte-bandinj, nargil, badinj.
Sing.: Pol, pol-gass, pol-gaha pol-nawasi, tambili.
Burm.: Ong, ung, ung-bin, on, onsi, onti, ondi.
Java.: Kalapa, Bhungkana, ijor, Bhungkana njijor, enjor, ijor, kerambil, klapa, klendah, njejor, njijor, njor, tangkal kalapa, wii klapa, wit krambil.
Phillippines: Niog.
Polynes.: Niu.
Guam.: Niyog.

OF THE WOOD:

English: Coco wood, porcupine wood.
German: Kokosholz, Stachelschweinholz.

OF THE COTTON OR TOMENTUM:

English: Coco nut cotton.
Dutch: Kokosgaren.
Tam.: Tenna maruttu pungie.
Tel.: Tenkaia-chettu-puthie.
Mal.: Tennam-puppa.

OF THE CABBAGE:

English: Coconut cabbage.
German: Palmhirn, Palmkohl.
Dutch: Hersenen van den palmboom, kool van den palm, palmkool.
French: Chou palmiste.

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Tam.: Tennam kurtu.
Tel.: Tenkaia gurtu.
Arab.: Naril-ka-krute.

OF THE BROOMS MADE OF THE LEAF-RIBS:

English: Goa brooms.

OF THE GUM:

German: Cocosgummi.
French: Gomme de coco.

OF THE TODDY:

English: Palm wine, toddy.
German: Palmwein, Toddy.
Dutch: Palmwijn, toddy.
French: Vin de palmier, toddy, vin de palmiste, vin soury.
Hind.: Nareli.
Duk.: Narel-ki-sendi, narillie.
Tam.: Tenga-kallu, tennan-kallu, tennang-kallu.
Arab.: Nargilie, nargilli.
Pers.: Tariye-nargil.

OF THE SUGAR:

English: Jagery, jaggery.
German: Palmzucker, Jaggery.
Dutch: Palmwijnsuiker, jagerie.

OF THE NUT:

English: Coconut, cocoanut, cockernut.
German: Cocosnuss, Kokosnuss.
Dutch: Cocosnoot, cokernoot, kalappusnoot, klapper (noot), kokernoot, kokosnoot.
French: Coco, noix de coco, noix d'Inde.

OF THE FIBRE:

English: Coir, coir fibre, coir rope, cocoanut fibre, khair.
German: Cocosnussfaser, Cocosfaser, Coir, Kair.
Dutch: Coir (vezel), kajar, kokosvezel.
French: Fibre du cocotier, khair, bastin, caire, coir (e)
Mala.: Kayar.
Tam.: Tennam nar.
Tel.: Tenkaia nar.

OF THE HARD FRUIT SHELL:

Duch: Koker.

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OF THE WATER:

English: Coconut water, coconut milk.
German: Cocosmilch, Kokosmilch, Kokosnusswasser.
Dutch: Klapperwater, Kokosmelk, Kokoswei.
French: Eau de coco, lait de coco.
Duk.: Yelnir-ka-pani.
Tam.: Yella-nir:
Tel.: Yella-niru.

OF THE DRY KERNEL:

English: Copra, kopra, copperah.
German: Copra, Kopra, Kopperah.
Dutch: Kopra, copra, coprah, copperah, copperas.
French: Copre, coprah.
Hind.: Khopra.
Guj.: Khopru.
Duk.: Khopra, Khopre, ki-batti.
Tam.: Kobbarait-tengay.
Tel.: Kobbera, kobbera-tenkaya.
Mala.: Koppara.
Kan.: Kobari, kobbari.

OF THE OIL:

Latin: Butyrum cocoidis, oleum cocoinum, oleum cocois, oleum cocos.
English: Coconut oil, cocoa oil, coconut butter.
German: Kokosnussoel, Kokosoel, Cocosoel, Cocosnussoel, Cocosnussfett, Coconussbutter, Cocosbutter, Calappusoel, Kalappusbutter, Kopraoel, Vegetalin.
Dutch: Cocosolie, cocosvet, copra-olie, kalapaolie, kalappusolie, klapperolie, klappusolie, klappusolij, kokernootenolie, kokosboter, kokosnootolie, kokosnootenolie, cocosolie, plantenboter.
French: Huile de coco, huile de palme, beurre de coco.
Hind.: Khopare-ka-tel, nariyal-ka-tel, naril-ka-tel (also in Duk.).
Beng.: Narikel-tail, nariyal-tel.
Guj.: Naryal-nu-tel.
Mar.: Naralicha-tela, naral-tela, kobracha-tela.
Tam.: Tenga-yenney, taynga-nunay, tengai-yenne.
Tel.: Tenkaya-nune, tenkaya-nunay.
Mala.: Tenna-enna, minak, kalapu, minak-nur, nur-minak, kalambir, kalapa minak.
Kan.: Tengina-yanne, cobri.
Sancr.: Narikela-tailam.
Arab.: Dhonun-narjil, dhonul-jouzehindi.
Pers.: Roghane-nargil, roghane-bandinj.

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Sing. : Pot-tel.
Burm. : On-si.
Cochin-chin. : Cay-dua.

DESCRIPTION.—Trunk 40-80 feet high, straight or curved, marked with ring-like leaf scars, which are not prominent, rising from an inclined swollen base which is surrounded by a mass of rootlets. Leave 6-15 feet long; leaflets equidistant, 2-3 feet long, linear-lanceolate, coriaceous; petioles 3-5 feet long, stout.

Spadix 4-6 feet long, stout, androgynous, simply panicled. Lower spathes 2-3 feet long, oblong, hard, splitting lengthwise. Male flowers unsymmetric; sepals small, valvate; petals ¼ inch long, oblong, acute, valvate. Female flowers larger than the male, 1 inch long, globose, supported by broad bracteoles. Sepals 1 inch in diameter, round, concave, imbricate. Petals shorter than the sepals, convolute, with imbricate tips.

Fruit 8-12 inches long, 3-gonously obovoid or subglobose, green or yellowish; albumen lining the endocarp, the cavity large, filled with a sweet somewhat milky fluid, known as cocoa-nut milk.

In germinating the inner end of the embryo, an extension of the cotyledon, is developed into a special absorbing organ (the "apple"). From the outer end of the embryo, situated below one of the openings at the apex of the shell, grow the plumule and the roots. The specialized cotyledon at first attacks and proceeds to digest the part of the kernel adjacent to the embryo. It continues to grow until it fills the entire cavity of the nut, the kernel of which becomes soft. The roots push forth and enter the soil before the kernel is totally absorbed, and finally the union between the young plant and the cotyledon is broken and it begins an independent existence. The function performed by the husk is protective. It is of low specific gravity and keeps the nut afloat if it falls into the sea, so that the nut may be transported from shore to shore by ocean currents.

HAB.—The original home of the Coco-nut tree and the history of its spread are not yet sufficiently known. The Sanscrit name indicates its ancient cultivation in India; it was, however, not known to classic writers, and it seems certain that it was introduced by the Portuguese into Western Africa and the Cape Verde Islands, and that it did not exist in the West Indies, Guiana, nor Brazil at the time of the discovery of America. It has been supposed to be indigenous in the Indian Archipelago and on the Nicobar and Coco islands of the Bay of Bengal—and this would explain its early cultivation on the coasts of India and Ceylon. But all the other species of the genus *Cocos* are confined to South America, and those that have been said to be indigenous in Mexico, seem to belong to the genus *Attalea*. Considerations of botanical geography would, therefore, point to the west coast of Central America as its home. Martius, indeed, consi-

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ders it not improbable that the original home of this palm was on the islands near the Isthmus of Panama, and that the nuts were transported thence by westerly currents to Cocos Island, 200 miles west of the coast, which was found densely covered with coco-nut trees by its first discoverer, without any sign of human habitations. From there it is not difficult to explain the further spread of the nuts by the regular currents and by storms to the Sandwich, Marquesas, and other islands of the Pacific, and to the islands of the Indian Archipelago, whence it may have been introduced into India. A. De Candolle seems inclined to accept the American origin of the coco-nut, and Griesebach entertains no doubt on the subject. Cook has recently shown that the coco-nut is in all probability a native of America. At present it is found in every part of the tropics, where it flourishes in the greatest luxuriance in the vicinity of the sea, especially a few feet above high-water mark. Although that is its chief habitat, it cannot be termed an exclusively littoral plant, for it has been met far inland, *e.g.*, at Merida in Yucatan, at Patna in Bengal, at Concepcion del Pao. With regard to the latter place Humboldt remarks: "I was the more struck with the fact (of finding the coco-nut tree at this great distance from the sea) because the veracity of those travellers who have asserted the existence of this Palm at Timbuctoo, in the centre of Africa, has been called in question. Bonpland and I saw it repeatedly amid the cultivated spots on the Rio Magdalena, more than a hundred leagues from the coast." There is, on the other hand, no doubt that the Coco-nut Palm refuses to grow in many countries any distance inland, with as much pertinacity as it does in the conservatories of Europe, where, after having attained the age of eight or ten years, it begins to sicken, and soon dies. Seemann affirms, from personal knowledge, "that numerous trials have been made to cultivate it in the central parts of the Isthmus of Panama, but that all of them have failed," and he adds: "The causes therefore which regulate this curious phenomenon are still involved in obscurity, and I should not be surprised to hear that theorists, eager to account for this apparent contradictions in the distribution, had been driven to the necessity of making several species of this Palm, which, as there exist several well-marked varieties, would not be a task attended by great technical difficulties."—Whenever the Coco-nut Palm ventures beyond the limits of the tropics, it loses in elegance of aspect and power of productiveness. In the Sandwich Islands, just at the edge of the torrid zone, it has a mean look, and yields fruit in comparatively small quantities.

Flowers throughout the year and the nuts require 9-10 months to come to maturity.

USES.—Few of any products of the vegetable kingdom are so valuable to man in those countries where it grows as the Coco-nut

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Palm, for there is scarcely any part of the plant which cannot be applied more or less to some use by the inhabitants of tropical climates.

"MILK."—The nut yields an abundance of a delicious, cooling beverage, to which Madeira wine, brandy, etc., is sometimes added. The water, beautifully clear, has a sweetness, with a slight degree of astringency, which renders it very agreeable. This "milk" has been erroneously considered as injurious, producing a predisposition to dropsical complaints, and among the Tahitians as one of the exciting causes of féfé, or elephantiasis. This applies, in all probability, to the ripe nut, at which stage the water is unwholesome, and can be drunk only sparingly, as it is strongly diuretic and is apt to produce an irritation of the bladder and urethra. The milk of young nuts, on the contrary, is harmless. "I have," says Bennet, "adopted this cooling beverage during my frequent and long visits to intertropical countries, and have always found it the most cooling and refreshing beverage during my excursions; but when an immoderate quantity is drunk, I have known a slight degree of strangury produced by it. The ladies, however, who may fear taking it internally, are informed that to the water of the green coco-nut is ascribed that inestimable property to them, of clearing the face of all wrinkles and imperfections whatever, and imparting to it the rosy tints of youthful days." The water is used by house-plasterers in preparing a fine whitewash, also in making the best and purest castor-oil, a certain portion of it being mixed with the water in which the seeds are boiled. W. v. Lœwenich made the following analysis of the liquid albumen of the coco-nut:—

Water	900·88
Sugar	4·43
Gum	17·67
Extractive matters (fat) ...	28·29
Salts soluble in alcohol	5·44
Salts not soluble in alcohol ...	6·29

MEAT.—From experiments conducted by Kirkwood and Gies it was found that the fresh meat contains 35—40 per cent. of oil, 10 per cent. of carbohydrate, only 3 per cent. of proteid, 1 per cent. of inorganic matter, and near 50 per cent. of water. The albumen in the young nut is very delicate, easily removed from the shell with a spoon, and may very well be named a vegetable blancmange; in this state it is called Niaa by the Tahitians, who use it, as well as the natives of other of the Polynesian Islands, in several made dishes. After the fruit is suffered to remain a short time longer, and the albumen becomes

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firmer, the Tahitians change the name to Omate, and the fully ripe nut is called Opaa; in this state it is sometimes, but seldom, eaten, being used principally for making oil, as it contains a small quantity of oily milk; it is in this state the nuts are seen and sold in Europe. In Ceylon, when the nut is fully ripe it is called Pol, or curry coco-nut. The kernel, after being reduced to a small size by a certain instrument (hiromane) is placed in a cloth, and water being poured on it, a white juice is extracted by pressure, used invariably, either with or without the grated kernel, in their various curries. A sort of tart, or cheesecake, is made from the kernel of dry nuts rasped or pared down. In New Granada the Negroes boil it with rice. On the Pacific Islands the meat of the ripe coco-nut, though agreeable to the taste, is seldom eaten. It is fed to domestic animals of all kinds, even to cats and dogs, and is very fattening. In Guam it is rasped or grated and fed to chickens, but they do not lay so well when living upon a coco-nut diet as when fed with corn. From the grated meat a rich custard, or 'cream' is expressed, which is extensively used throughout Polynesia as an ingredient for native dishes. One of the most savoury of these, in which it is cooked with tender young leaves of *Caladium coloçasia*, is in Sanwa called "Palu-sami." This cream contains much oil, as well as carbohydrate and proteid, and is consequently very nourishing as well as pleasant to the taste. In Guam the natives combine it with rice in various forms, and sometimes prepare it like a simple custard. It makes an excellent broth when boiled with a fowl or with other meat, and in the early days of long voyages nuts were carried to sea and used by the sailors for making rice-milk, a dish which they had learned from the natives to prepare (Safford). Another use to which the natives of Guam apply the meat of the coco-nut is the fattening of the "robber crab" (*Birgus latro*), which they keep in captivity until fit for the table. The following is a description of the habits of this crab by Charles Darwin: "The animal is very common on all parts of the dry land of the Keeling Islands, and grows to a monstrous size. The front pair of legs terminate in very strong and heavy pincers, and the last pair are fitted with others weaker and much narrower. It would at first be thought quite impossible for a crab to open a strong coco-nut covered with the husk; but Mr. Liesk assures me that he has repeatedly seen this effected. The crab begins by tearing the husk, fibre by fibre, and always from that end under which the three eye-holes are situated; when this is completed, the crab commences hammering with its heavy claws on one of the eye-holes till an opening is made; then, turning round its body, by the aid of its posterior and narrow pair of pincers, it extracts the white, albuminous substance. This is certainly a curious case of instinct, and likewise of adaptation in structure between two objects apparently so remote from each

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other in the scheme of nature as a crab and a coco-nut tree. The *Birgus* is diurnal in its habits, but every night it is said to pay a visit to the sea, no doubt for the purpose of moistening its branchial. The young are likewise hatched and live for some time on the coast. These crabs inhabit deep burrows which they hollow out beneath the roots of trees, and where they accumulate surprising quantities of the picked fibres of the coco-nut husk, on which they rest as on a bed. The Malays sometimes take advantage of this, and collect the fibrous mass as junk. These crabs are very good to eat; moreover under the tail of the larger there is a great mass of fat, which, when melted, sometimes yields as much as a quart-bottle full of limpid oil. It has been stated by some authors that the *Birgus* crawls up the coco-nut trees for the purpose of obtaining the nuts. I very much doubt the possibility of this; but with the screw-pine (*Pandanus*) the task would be very much easier. I was told by Mr. Liesk that on these islands the *Birgus* lives only on the nuts which have fallen to the ground."

OIL.—Another valuable production of the coco-nut is the oil, which is an article of exportation from India, Ceylon and Polynesia. It is procured by first extracting the kernel from its outer integument or shell, and boiling it in water. It is then pounded and subjected to great pressure. This being boiled over a slow fire, the oil floats on the surface. This is skimmed off as it rises, and again boiled by itself. Fourteen or fifteen nuts will yield about two quarts of oil. A somewhat different practice obtains on the Malabar coast. The kernel is divided into two equal parts, which are ranged on shelves made of laths of the Betel-nut Palm, or split bamboo, spaces being left between two laths of half an inch in width. Under them a charcoal fire is then made, and kept up for two or three days, in order to dry them. After this process they are exposed to the sun on mats, and when thoroughly dried are placed in an oil-press, or sicoor. When the oil is well extracted by this method, a hundred nuts will yield about two gallons and a half of oil. This method is usually resorted to when the oil is required for exportation; the former, when merely used for culinary purposes. The application of steam, especially to a press, for the purpose of procuring the oil, has been attended with the greatest advantages. "At Tahiti they procure the Morii, or oil, from the nuts, by first grating the kernel, then depositing it in the hollow trunk of a tree, or some kind of hollow vessel, which is exposed to the sun during the day. After a few days have elapsed, the grated nut is heaped up in the trough or vessel, leaving a space between the heaps; the oil exuding, drains into the hollow spaces, whence it is collected into Bamboo canes, containing each a gallon or more; in this way it is sold for export; but the indolence of the natives prevents its being so important an article of traffic as it might be

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in the South Seas. Sometimes the Tahitians, after the oil ceases to collect in the vessel, put the kernel into a bag, and submit it to the action of pressure by a rude lever press; but the oil thus obtained is considered inferior to that procured by the heat of the sun" (Seemann). Coco-nut oil in India is used chiefly for culinary purposes, burning in lamps, etc. The oil is at first odourless, and with a slight flavour which is agreeable to the taste. It soon turns rancid, however, and in this condition is unfit for food. Coconut oil is perfumed by macerating in it the blossoms of fragrant flowers and substances. "In the South Seas the natives, though preferring fresh and perfumed oil for anointing the head and body, do not hesitate to make use of rancid oil for these purposes. In Samoa certain kinds of tapa, or bark cloth, are always treated with oil before they are suitable for wearing as clothing, so that to those who have cruised among the islands of the Pacific the smell of rancid coco-nut oil always brings to the minds visions of brown skinned natives and thatch-roofed huts nestling beneath groves of coconut palms. The natives of Guam still use coconut oil for anointing the hair; but with the custom of wearing clothes that of anointing the body has died out, and the oil is used only for massaging the body in case of sickness. Though the use of petroleum is now general on the island, coconut oil is still sometimes used for illuminating. Until recently certain people paid their taxes partly in oil, which was used for lighting the tribunal. Nearly every house on the island has its little shrine, where before the patron saint a lamp of coco-nut oil is always kept burning. This lamp consists of an ordinary drinking glass filled with water, upon which the oil is poured. A wick projecting from a float is fed by the oil, and the water keeps the glass cool" (Safford). The oil is also exported to Europe and the United States where it is used for the manufacture of soap and candles. The chief sources of coconut oil are Ceylon and the Madras Presidency, especially the district of Cochin. That which is shipped from Cochin bears generally a higher price than that from Ceylon. Soap made from coco-nut oil is more soluble in salt water than that made from other oils or fats, and is consquently much used on seagoing vessels. One objectionable feature of soaps made from this oil is the disagreeable rancid odour which they usually leave on the skin after washing with them. The most serious difficulty encountered by soap makers is the elimination of fatty acids contained in it. To remove these the oil is heated with lye, an emulsion is made and the oil extracted from the mixture by means of a separator and receiver. Coco-nut oil is not usually employed in soap making but is added to other oils for the purpose of producing quickly solidifying soaps containing a large proportion of water.

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COPRA.—The dried kernels (copra) as also the Poonac, are sent to Europe and the United States from Ceylon and Cochin. The Poonac is the refuse of the kernel after the oil has been expressed. It is very fattening to fowls and cattle, and forms the best manure to young Coco-nut trees, as it returns to the soil many of the component parts which the tree has previously extracted for the formation of the fruits. For this reason it has been found worth while to transmit the Poonac to those localities where the Coco-nut tree grows far inland, away from the saline soil of the coast. The Coco-nut Palm abstracts from the soil chiefly silex and soda, and where these two salts are not in abundance, the trees do not thrive. Copra is used extensively in France, Germany, Spain and England, chiefly in soap making, but also in the manufacture of certain food products resembling butter. This "cocoa butter," or "cocoaline," should not be confounded with the "cocoa butter" made from cacao (*Theobroma cacao*), the source of chocolate, which is also an important commercial product. The process of manufacture of coco-nut butter has been kept secret. The main difficulties to overcome were the tendency to rancidity of the fats and its liquid consistency. The credit for carrying on experiments which finally led to success is due to the firm of Rocca, Tassy and deRoux, of Marseilles, who have also erected a plant at Hamburg. Magnan Frères have more recently succeeded in making a satisfactory butter by independent experiments and some German houses are now doing the same thing. "The effort to extract an edible grease from an oil produced upon so vast a scale and formerly available only for the manufacture of soap gave promise of valuable returns if successful; and that this promise was not delusive may be judged from the circumstance that the factory of Rocca, Tassy and de Roux, which produced 25 tons of butter per month in 1900, turned out 600 tons per month in 1902. The butter is not at all a by-product of the manipulation of the oil, as in the factory of Messrs. Rocca, Tassy and de Roux, 7,200 tons of butter are obtained from 8,000 tons of oil per annum in a year of maximum results. The butter is styled "vegetaline" and cocoaline, the greater demand being for the former. The first named melts at 26° C. and the latter at 31° C., being by that fact better suited for warm climates. In the United States the principal manufacturers of food products from coco-nut oil are the India Refining Company, of Philadelphia. They have a process by which the rancidity of the oil is eliminated, so that it is sweet, neutral, and adapted for family use and for manufacturing purposes by bakers, confectioners, and perfumers. One brand called "Kokoreka" consists of the stearin of the coco-nut oil, having a melting point of about 27·3° C. This is used by manufacturing confectioners in combination with or in place of cacao-butter. A lighter brand, called "ko-nut" is used

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for baking and domestic purposes in place of butter and lard. It has a melting point of about 23° C. Specimens of these products submitted to the Bureau of chemistry of the Department of Agriculture for analysis, proved to be remarkably free from fatty acids, the "ko-nut" containing 0·13 per cent. and "kokoreka," the harder substance, only 0·04 per cent. In consequence of tests made by Dr. Theodor Ternes, of the Royal Imperial Hospital of Vienna, an official report was made, stating that coco-nut butter meets all hygienic requirements; that it is superior to animal fat and butter; that it is easily digested and is particularly well adapted for the use of patients suffering from impaired digestion" (Safford).

FIBRE.—Coir, or the fibre of the husk of the coco-nut, is another product of commercial importance. It is imported into Europe and America in the form of coir yarn, coir fibre, coir rope, and bristle fibre, and is principally used in manufacturing matting and brushes. There are several ways of stripping the fibres from the husk. One is by placing a stake or iron spike in the ground, and by striking the nut on the point, the fibres are easily separated. In this manner, it is said, a man can clear 1,000 nuts daily. In the Laccadives the following method of making coir is employed. "As the husk gets hard and woody if the fruit is allowed to become quite ripe, the proper time to cut it is about the tenth month. If cut before this, the coir is weak; if later, it becomes coarse and hard, and more difficult to twist, and requires to be longer in the soaking pit and thus becomes darker in colour. When cut, the husk is severed from the nut and thrown into soaking pits. These, in some of the islands, are merely holes in the sand, just within the influence of the salt water. Here they lie buried for a year and are kept down by heaps of stones thrown over them to protect them from the ripple. In others, the soaking pits are fresh-water tanks behind the crest of coral. In these the water not being changed becomes foul and dark coloured, which affects the colour of the coir. When thoroughly soaked the fibrous parts are easily separated from the woody by beating. If taken out of the pits too early, it is difficult to free the coir from impurities. If left too long, the fibre is weakened, as is said to be the case also with that soaked in fresh water" (Robinson). These different modes are also practised in Ceylon. There exists, however, no such necessity for steeping the husk so long in water, it having been found that a shorter time is sufficient. It has been proved that the fibre from the husk of the ripe fruit is greatly improved in quality and appearance by beating, washing, and soaking, and that the old method of steeping in salt water for 18 months or two years is quite unnecessary, and that it produces a harsher and dirtier coir. All these processes have been replaced in many districts by improved methods, in which the fibre is extracted from the husk, either wet or dry, by means of

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machines. The husks are crushed in a mill, consisting of two adjustable fluted iron rollers. The pressure here exerted flattens them and prepares them for the "breaking down," or extraction of the fibre, performed in an "extraction" composed essentially of a drum or cylinder whose periphery is coated with steel teeth that catch in the fibre and tear it from the husk. The machine is covered with a wooden case to prevent the fibre being scattered. It is then "willowed" or cleaned, graded, and baled for shipment. Coir is much used in India in place of hair for stuffing mattresses, and is certainly preferable to those stuffed with ox or cow-hair. It is also employed for stuffing cushions for couches and saddles. Large quantities are annually shipped to Europe, where it is manufactured into brushes, mats, and carpets, and even hats and bonnets. The fibre is rather difficult to twist; still it is made into ropes for ordinary purposes in shipping. It is one of the best materials for cables, on account of its strength, lightness, and elasticity. These cables are further valuable because they are durable, particularly when wetted with salt water. "Numerous instances have been related of ships furnished with cables of this light, buoyant, and elastic material, riding out a storm in security, while stronger-made though less elastic ropes of other vessels snapped in two, and even when chain cables have given way. Indeed, until chain cables were so largely introduced, most of the ships navigating the Indian seas were furnished with coir cables. Though rough to handle, and not so neat-looking as hemp cordage for rigging it is yet, when properly made, sufficiently pliable, and being elastic, it is well suited for running, rigging, where lightness is an advantage, as for the more lofty sails and sheets; but from its elasticity it is not considered so well adapted for standing rigging." (Royle). According to Wight's experiments coir cordage broke with 224 lb., whilst *Hibiscus cannabinus* bore only 190 lb., but the Moorva, 316 lb. The soft downy fibre produced at the bottom of the fronds is used to stop bleeding from the wounds. This fibre is altogether of a more delicate nature, and forms a kind of network, which is beautifully white, and even transparent when young. As the fronds grow older, this natural matting becomes coarser, tough, and of a brownish colour. It may be stripped off the tree in large pieces, which are used in both India and Ceylon as strainers for palm wine or coco-nut oil, or for straining sago or arrow root. In Ceylon it is manufactured into a course kind of cloth for bags and coverings, and from these bags again a course kind of paper is made.

Toddy.—The Palm wine or toddy is obtained from the flower-spathes before the flowers have yet expanded. To procure the toddy the spathe is tied with strips of the young leaves (which are much tougher and stronger than the old ones) to prevent its expansion. It is cut a little transversely from the top, and beaten either with the

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handle of the toddy-knife, or a small piece of ebony or iron-wood ; this process is continued morning and evening (at dawn of day and just as the sun declines below the horizon) for five or six successive days ; then the under part of the spathe is taken off, so as to permit of its being gradually bent, when the toddy-drawers, for the purpose of keeping it in that position, attach it to some neighbouring leafstalk. After a further period of five days, an earthen chatty or calabash is hung to the spathe, so as to receive the toddy that exudes, which is collected every morning and evening, and the spathe cut a little every day ; the quantity collected varies much. If the toddy is drawn early in the morning and drunk at once, it forms a pleasant drink, it tastes most delicious, having a slightly stimulating effect, and acting as a gentle aperient, a remedy admirably adapted for constipated habits, particularly those of delicate constitutions. Fermentation takes place in the liquor a few hours after it has been collected, and it is then used by the bakers as yeast, the bread made with it being remarkably light. Toddy is considered by Europeans as highly unwholesome during the rainy season. The fermented liquor is much drunk by the natives. From the fermented liquid a kind of rum is distilled, called arrack in the East Indies. It is said that 100 gallons of toddy will produce 25 of arrack. According to Padre Blanco its immoderate use by the Filipinos caused great harm, resulting in sleepiness, loss of appetite, premature old age, extraordinary obesity, and diseases resembling dropsy and scurvy. Some of those that are addicted to it lose their intellectual faculties, are seized with trembling, or become stupid, absent-minded, or even insane. If toddy is allowed to undergo the acetous fermentation a very good vinegar is produced. The toddy also yields abundance of jaggery or sugar. The toddy being collected in a chatty, as above mentioned, in which a few pieces of the stem of the Allghas (*Alpinia allughas*, Rox.) had been placed, a supply of sweet toddy is procured mornings and evenings. Particular care is required that the vessels be regularly changed, and that none are employed unless they have been well cleaned and dried. Eight gallons of sweet toddy, boiled over a slow fire, yield two gallons of a very luscious liquid, called Penni, or honey, or jaggery, or sugar-water. If this is boiled again, it yields a kind of course brown sugar, called jaggery, which is formed into round cakes, and dried in the smoke of the huts. In order to preserve it free from humidity, each cake is separately tied in pieces of dried banana leaves, and kept in a smoky place, unless required for family use or the market (Seeman).

LEAVES.—When used for thatch the leaves are split down the midrib, the two halves placed together end for end, and the leaflets braided diagonally. Long mats are woven to cover the ridge of the roof, and secured in place by wooden pins passing through them below the ridge pole and projecting on each side. Coco-nut thatch

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is not as durable as that of the Nipa Palm, a roof of the Coco-nut leaves lasting but four years, while one of Nipa will last from ten to twelve. Many of the natives' huts in India, Ceylon, as well as in Polynesia, are almost entirely constructed of materials derived from the Coco-nut tree. The Tahitians plait the leaves for screens, or as covering for the floors; for similar purposes, and also as a thatch, it is used by the natives of the islands of Rotuma, Tongatabu, and other of the Polynesian Islands. The ribs of the leaflets are slender, strong, and somewhat elastic. They are frequently tied in bunches and used as brooms for sweeping about the fire-places, and in Samoa are used as forks in eating. Indeed, in those islands the word "tua niu" (coco-nut leaflet rib) is applied to forks in general, and is also used for wire and as the name of certain pinnate ferns which have a slender stiff midrib. Skewers, knitting needles, and toothpicks are also made of tua-niu, and in the early days the oily kernels of the nuts of *Aleurites moluccana* were strung on them, like pieces of meat on a brochette, and served the Samoans and other Polynesians as candles. On many of the Pacific islands tua-niu, neatly smoothed and pointed, were made into combs both for use and for ornament. In Ceylon and throughout Polynesia the dry leaves are used as torches, both for themselves during the dark nights or to carry before the carriages and palanquins of the Europeans. The washermen of Ceylon burn the foliage for the sake of its alkaline ashes. The leaves formerly played a part in many of the religious ceremonies of the Tahitians, and were also an emblem of authority; they were sent by the chiefs to their dependents when any requisition was made. Through the leaf tied to the sacrifice the god was supposed to enter; and by the same road the evil spirits, who, it was imagined, tormented those afflicted with diseases, were driven out. Bunches or strings of the segments were also suspended in the temple on certain occasions, and answered the same purpose as rosaries, reminding the worshippers of the order of the prayers.

Wood, Root, Cabbage, etc.—The outer wood of the stem is close-grained with dark-brown vascular bundles; it works smooth and takes a good polish. It weighs 70 lb., value of P. 608. The wood is devoted to various purposes: among the Polynesians it is used for shears, rafters, fences, etc., and converted into charcoal. When the tree has ceased to bear fruit, it is most valuable, and is imported into the European markets under the name of Porcupine wood. It is made into ornaments and fancy articles. Among the Singalese it is used for rafters, laths, shingles, chairs, ladies' work-boxes, etc., but during the period of its most abundant bearing (considered to be between ten and thirty-five years' growth), the heart is of so soft and spongy a nature, that it is merely used for fences, water-pipes, etc. From the trunk the

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Tahitians extract a gummy substance called Pia Pia; it possesses no fragrant property, but is used by the females to spread over their hair, in the same manner that they are accustomed to use the viscid gum of the Bread-fruit tree. The terminal bud, or cabbage, is an excellent vegetable, either cooked, or dressed in stews, hashes, or ragouts; but as the removal of the bud kills the tree, the natives indulge themselves in eating it only on occasions of festivity. They either select for this purpose a tree which is comparatively sterile or one which too closely crowds a neighbour. The root is occasionally used instead of areca-nut by betel chewers. In Samoa coco-nut shells are the only water vessels of the natives, and are used as vessels for oil. The open eye serves as an orifice, and a small grommet is passed through the other two eyes by which it is suspended. To remove the kernel, the natives, after having poured out the water through the open eye, immerse the nut in the sea, where the kernel soon putrefies and is eaten by marine animals. It is then thoroughly cleansed and the outside is frequently polished. Both in Samoa and Hawaii the shells are made into cups, in which kava is served. These are often highly polished and become lined with a beautiful pearly enamel from the deposit gradually made by the kava. In many islands the natives also make spoons, dishes, beads, and finger rings of Coco-nut shell, and use broken shells for keeping up the fires in their houses by night.

MEDICINAL PROPERTIES.—The oil is used as a substitute for cod liver oil in debility and phthisis; but in such cases it is not the commercial oil in its crude state, but the oleine obtained by pressure, refined by being treated with alkalies, and then repeatedly washed with distilled water. Its prolonged use, however, is attended with disadvantage, inasmuch as it is apt to disturb the digestive organs and induce diarrhœa. An inunction of the oil to the whole body is used in fevers, and to the chest in lung diseases. It is used as an application for the growth of hair and to prevent them from turning grey. The expressed juice or milk of the fresh kernel has been successively employed in debility, incipient phthisis, and cachexia. In large doses it proves aperient, and in some cases actively purgative, on which account it has been suggested as a substitute for castor-oil. The fresh kernel or the tender pulp is nourishing, cooling, diuretic, and refrigerating. Toddy is refrigerant and diuretic. The juice of the kernel, with kali jiri, is locally applied to freckles with relief. Old and dried kernel is cut into thin slices and used as an aphrodisiac ingredient in confection; also as an anthelmintic, it is used in removing tape-worms.

CULTIVATION.—"The Coco-nut Palm is a very beautiful tree for a large garden. It grows very freely on the coast, but inland can be cultivated on a river bank with good alluvial soil, or on a

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well-drained terrace with made up soil and abundant water. A Coco-nut that has been ripened on the tree should be planted with the husk on a bed of old leaf mould in a shady place. In planting lay the large fruit on its side; from 3—6 months is required to germinate. When it has formed three or four leaves it can be transplanted safely. Fruit is produced at ages varying from four to twelve years.

In making a Coco-nut plantation in the Thana district plants are reared from selected nuts that have been ripened on the tree. They are gathered during the hot season, then hung up in the house for two or three months and afterwards thrown into a well to germinate while floating on the water, or planted in very sandy soil about one foot apart, in a shady place where water can easily be given sufficiently to keep the soil moist. For planting, holes are dug 18 feet apart in both directions, and a small basket of wood ashes put in to keep off white ants, which might eat up the albumen or kernel from which the young plant should draw nourishment until it has roots of its own. One year seedlings are suitable if strong, but more commonly two year old plants are set out, then shaded with palm leaves, and the intermediate ground cultivated with annual crops that require irrigation. In any case the young Coco-nut Palms need to have the soil kept moist and well manured until the palms are five years old; after that it will depend on the nature of the soil, whether irrigation is necessary or not. If water is not available at a short distance from the surface, irrigation must be used. After it is 5 years old if well grown, if not, later by 2 or 3 years, during the rainy season, a ditch is dug round the tree at a distance of 4 feet, cutting some of the roots. Into the ditch a heavy dressing of dry fish or other strong nitrogenous manure is given, and the stem banked up so as to cause the rain-water to soak down near the root instead of running off. If well grown, fruiting begins at 5 years old, but 7 years is a more common age. Growing Coco-nuts requires much capital, because assuming that sufficient wells exist on the estate, an expenditure of Rs. 1,700 per acre during the first seven years may be necessary. In favourable circumstances an income of Rs. 700 may be expected from annual crops planted between the rows of Coco-nut Palm during the same period. The coco-nut is a tree that lends itself to cultivation greatly, and flourishes very much in proportion to the soil and cultivation it obtains. I have trees that are equally healthy, some 60 feet high, and others 70 feet high, that were planted on the same day 18 years ago. The annual expenditure may be reduced, but it rarely occurs that the total expenditure required to bring an acre of Coco-nut trees into full bearing is less than Rs. 7,000.

The value of the produce depends on the proximity of markets; near Bombay it is estimated to be Rs. 510 yearly per acre, from which an annual cost of cultivation and assessment amounting to

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187 must be deducted, leaving a yearly profit of Rs. 323 per acre to the cultivating landowner, presumably from established plantations. The proximity of the second city in the British Empire, and the consequent high value of toddy, no doubt, is an important factor in this estimate" (Woodrow).

ILLUSTRATION.—Plate LXXXVI shows a characteristic grove of Coco-nut Palms on Bombay Island. The photograph was taken by Rev. Fr. M. Maier.

Sub-genus II.—GLAZIOVA—Syagrus (partim) Mart.—*Glaziova et Cocos sectionis Syagri (excl. sp. typica)* Drude.

Female flowers ovate-conical, acute; sepals acute, tips in aestivation free (always ?); petals at the base convolute-imbricate, with valvate tips.

Fruit small or of medium size, unilocular; pericarp fleshy-fibrous or dry; endocarp woody, bony or stony, not callous on the inner surface, uniform, longitudinally 3-striped, the pores subbasilar; the dissepiments membranous or papery; albumen equable, more or less hollow; embryo basilar.

Species about 17. In tropical South America, except the western region of the Andes.

COCOS OLERACEA, Mart. Hist. Nat. Palm. II, p. 117, t. 82 (exl. fig. III ?) et tab. Z. f. VIII; Z. II, f. XIV; Z. X. V., f. 1, et vol. III, p. 324; H. Wendl. in Kerch. Palm. 241; Drude in Mart. Fl. Bras.—III, p. II, 416 (*excl. syn. Syagri picrophyllæ*. B.—R. ?) et. var. *β platyphylla (partim.)* Drude l. c. 417 ?; Barb.—Rodr. Les Palm. p. 28, t. III, f. 3 a. b.—*Palma iraiba*, Piso, Bras. ed. 1658, p. 129.—Rai, Hist. II, p. 1361.

NAMES.—Cabbage coconut tree, Iraiba; Coqueiro amargozo (Brazil).

DESCRIPTION.—Stem erect or slightly flexuose, 60-80 feet high, thicker at the base, almost 1 foot in diameter. Leaves dense, 6-8 feet long, arcuate-deflexed; leaflets linear, subfalcate, acute, 1 foot long and more, 3-4 (rarely 5-6) approximate, dark green above, glaucous beneath.

Spadix rising from between the inner leaves, first erect, then patent or nodding, 1½-2 feet long; peduncle terete or slightly compressed, glabrous, greenish-white; rhachis terete-angular, divided into simple branches; bracts membranous, transversely linear, at the base of the single branches and some bigger ones on the peduncle. Spathe 1½-2 feet long, subclavate, linear-lanceolate when open, longitudinally furrowed. Male flowers with small membranous bracts; calyx scarcely 1 line long, triangular; sepals 3, acute-pyramidal, pale. Corolla 4-5 lines long, yellow; petals erect, linear-lanceolate, acute. Stamens included; filaments subulate, white, short, united at the base; anthers linear, obtuse, emarginate at the base. Pistillode, minute, subtrigonous. Female flowers conical,

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fewer than the males, between 2 males or single. Sepals ovate-pyramidal-acuminate, involute, glabrous. Petals entirely surrounded by the calyx. Ovary ovate, glabrous, attenuate towards the apex; stigmas 3.

Drupe about 1½ inches long, ovate.

HABITAT.—Brazil, in the mediterranean region of Minas Geraes. Flowers in August.

Sub-genus III—ARECASTRUM, Drude (*emend.*).

Female flowers ovate; tips of the sepals in aestivation cucullate (always?); petals at the base convoluto-imbricate, tips valvate.

Fruit of medium size, ovoid, unilocular; pericarp often fleshy-fibrous, sweet; endocarp large, bony, marked with 3 sub-basilar pores, produced inside to the base of the fertile cell; the traces of the suppressed cells small in the large bony substance of the endocarp. Seed irregular, conform with the cell, gibbous-curved; albumen equable, slightly hollow; embryo obliquely basilar.

Species about 7. In tropical and extratropical South America, extending to 35° Lat., except the western region of the Andes.

COCOS ROMANZOFFIANA, Chamisso in Choris, Voyage pitt. autour du Monde 5, t. V et VI (1822) et in Flora, VI. (1823) pt. I, 226; Mart. Hist. Nat. Palm. II, 127, t. 88, f. VII, et III. 321; Kth. Enum. Pl. III, 286; Wendl. in Kerch. Palm. 241; Hook. in Rep. Kew, 1882 (1884) 241; Drude in Mart. Fl. Bras. III, II. 419, t. 92 (excl. fig. II); Becc. Le Palm. incluse nel gen. cocos, in Malpighia, anno I, fasc. VIII, 25.

NAME.—Giriba Palm.

DESCRIPTION.—Stem 30-40 feet high, erect. Leaves arcuate-patent and recurved, pinnate, leaflets ensiform, reduplicate.

Spadices growing from between the leaves, 6—8 feet long. Spathes when closed clavate, erect, when open lanceolate, mucronate, pendulous, peduncle of spadix compressed-terete; branches with a coriaceous bract. Male flowers on the lower ⅔ of the branches together with the females, alone on the upper part. Calyx very small, about 1 line long; sepals triangular, acute; petals lanceolate, acute, about 6 lines long, longitudinally striate, sulcate inside on account of the pressure of the stamens. Stamens included; filaments subulate, at the base united into a disc, about 1 line long; anthers basifixed. Female flowers ovate-globose, 2-3 lines long; sepals coriaceous, subobovate-orbicular, very concave, culullate-imbricate (Martius); petals included in the calyx. Ovary ovate-globose, pubescent.

Drupe the size of a walnut.

HABITAT.—Brazil: Island of Santa Catharina.

COCOS PLUMOSA, Hook f. in Bot. Mag. t. 5180 (1860) et in Rep. Kew. 1882 (1884) 72, (non Lodd); Arcangeli in Bull. Società Toscana d'Ortic. III,

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FEATHERY COCO-NUT PALM (*Cocos plumosa*, Hook. f.)

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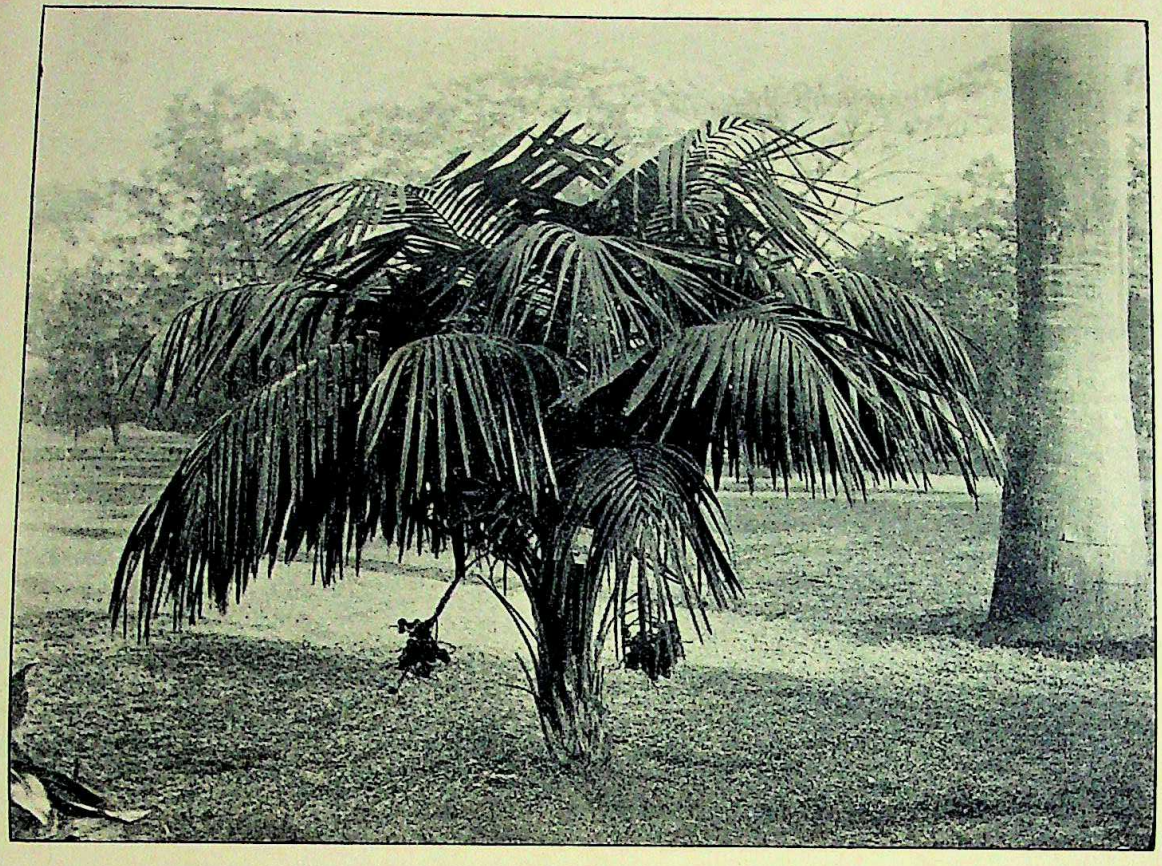

ARACURI PALM (*Cocos schizophylla*, Mart.)

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1878, 214; H. Wendl. in Kerch. Palm. 221; Drude in Mart. Fl. Bras. III, pt. II, 412; Becc. Le Palme incluse nel gen. cocos in Malpighia, anno I. fasc. VIII, 27—*Cocos comosa* Parlatore (*non* Martius) Les collect. bot. t. II.

NAME.—Feathery-flowered Coco-nut.

DESCRIPTION.—Stem graceful erect, columnnar, about 40 feet high, 10-12 inches in diameter, more slender upwards, jointed as it were with annular scars of the fallen leaf-stalks; these rings are 1 foot to 14 inches apart. Crown of leaves extremely beautiful; leaves 12-15 feet long, petiolate, lanceolate, pinnate, recurved; leaflets numerous, solitary, or more usually two to four aggregated, springing from near each other; petiole subtriangular at the base, very much dilated, of a greyish-brown colour, keeled, at the margin fimbriately fibrous, amplexicaul.

Spadix axillary, substipitate; spathe 2½-3 feet long, ligneous at first, at length bursting open laterally, concave and fusiform, almost woody, very erect, rigid, firm, dark dirty-green externally, within tawny, acute and apiculate; branches numerous, long, gracefully drooping, wax-like, loaded with flowers of two kinds which are sessile; some female, but mostly male.

Flowers in bud conical, sepals completely imbricated; petals ovate, concave, moderately patent, with minute bracts at the base. Male flowers with 6 oblong yellow anthers on short filaments. Female with a short downy ovary, crowned with three stigmas.

Drupe apiculate, about 1 inch long.

HABITAT.—Brazil.

ILLUSTRATION.—Plate LXXXVII shows a fine fruiting specimen of the Feathery Coco-nut Palm growing in a garden on Malabar Hill, Bombay.

Sub-genus IV.—BUTIA, Becc.—*Arecastrum* (*partim*) Drude.

Female flowers ovate; tips of the sepals cucullate in aestivation (always ?); petals convolute-imbricate at the base, valvate at the apex.

Fruit trilocular or by abortion regularly unilocular, ovoid or globose, small; pericarp fleshy; endocarp bony; its pores closed by a superficial, thin, half-woody septum often submedian; dissepiments of suppressed cells bony; seed regular; albumen homogeneous, not hollow; embryo often not basilar.

Species about 5. In South America, especially extra-tropical, except the western region of the Andes.

COCOS SCHIZOPHYLLA, Mart. Hist. Nat. Palm. II, 119, t. 84 et 85, T. f. IV, et vol. III, 324; H. Wendl. in Kerch. Palm. 241; Drude in Mart. Fl. Bras. III, II, 422; Hook. in Rep. Kew 1882 (1884), 72. *Cocos aricui*, Prinz v. Neuwied, Reise in Brasilien I, 272.

NAMES: Aracuri palm, (English); ariri, aricuri, alicuri (Brazil).

DESCRIPTION.—A low palm, often almost stemless; caudex 6—8 feet high, subannulate. Leaves 6-8 feet long; leaflets not quite

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equidistant, subopposite or alternate, erect-patent, linear or subfalcate, 1 inch broad, very reduplicate, apex rounded-obtuse, short-mucronate, the midrib very prominent above.

Spadix from between the leaves, 2-3 feet long; peduncle compressed, whitish-tomentose-pulverulent, with subtriangular coriaceous bracts; rhachis sulcate-angular. Branches many, in the lower part of the spadix about 2 inches distant, in the upper part more approximate. Spathe 3 feet long, with a mucronate top when closed, linear-lanceolate when open. Male flowers 2-3 lines long; calyx 3 or 4 times shorter than the corolla, whitish; sepals lanceolate-acuminate; petals lanceolate or linear-oblong. Stamens $\frac{1}{3}$ of the corolla; filaments subulate, white; anthers linear, emarginate at both ends; pistillode minute or absent. Female flowers subglobose or shortly conical, slightly larger than the males. Sepals broadly triangular or suborbicular, shortly acuminate. Petals suborbicular. Ovary subglobose. Stigmas pyramidal.

Drupe subglobose, the size of a pigeon's egg.

HABITAT.—Brazil: Province of Bahia at Camamu and Bahia, S. Jorge dos Llheos.

USES.—Of the leaflets hats are made. The juice of the unripe fruit is used in inflammations of the eyes.

ILLUSTRATION.—Plate LXXXVIII. The specimen photographed by the Rev. Fr. M. Maier may be seen in the Victoria Gardens, Bombay. Two bunches bear half ripe fruits.

COCOS YATAI, Mart, Palm. Orbign. 93 t. 1. f 1. t. 30, B et Hist. Nat. Palm. III, 289, 324; H. Wendl. in Kerch. Palm. 241; Drude in Mart. Fl. Bras. III, pt. II., 421, t. 94, 95; Becc. Le Palme incl. nel gen. Cocos, in Malpighia, anno I, fasc. VIII, 32.

NAME.—Yatai.

DESCRIPTION.—Stem covered in the upper part with the bases of the petioles. Leaves surrect, arcuate; petiole spinous-serrate; leaflets concinnous, slightly stiff, narrowly linear, acuminate.

Male flowers: Petals lanceolate, acute. Female flowers: Petals oblong—ovate, obtuse.

Drupe, size of a pigeon's egg, acute at the apex; putamen oblong, slightly acute at the base, rotundate at the apex.

HABITAT.—Argentine: in the provinces of Concordia, Corrientes and Entre Riòs, Brazil.

USES.—The fruit is an excellent fodder for horses, mules, and cattle. The seeds are eaten and an oil is prepared from them. The heart is eaten as an excellent cabbage. The leaflets are used in the manufacture of hats. The fleshy part of the fruits is anthelmintic.

(*To be continued.*)

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A CATALOGUE OF NEW WASPS AND BEES (*FOSSORES, DIPLOPTERA* AND *ANTHOPHILA*) DESCRIBED FROM THE INDIAN REGION SINCE 1897.

BY

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More than seventeen years have gone by since the late Col. Bingham brought out his excellent work on the wasps and bees of India as one of the volumes of that very useful "Fauna of British India" series. It is needless to state how considerably our knowledge of the aculeate hymenoptera of the Indian region has increased since 1897. Steady collecting and interesting observations have been made by workers in the different parts of the country and as a result several species new to science and a good many forms new to the region have been discovered in addition to a mass of literature that has accumulated on the taxonomical and biological aspects of the several already known forms. Unfortunately the descriptions of new forms and the mass of valuable information regarding known ones are all found scattered about in a host of different journals, reports, periodicals, etc. Hundreds of papers have been published on this group of insects and a good many of them in foreign languages. Until some one takes up the very difficult task of publishing a new edition of Bingham's volume with all up-to-date information, I am sure some difficulty will be felt by people working at the group—especially beginners, to lay their hands easily at the various references. In view of this fact I have made an attempt in the following pages to catalogue the various references to new species of Fossores, Diploptera, and Anthophila that have been described from the Indian region during the past sixteen years. In doing so, although the chief aim has been to list all new species—as a supplementary list to the species described by Bingham, I have also tried to include (*a*) references to a few forms already described from the Indian region before 1897, but which have been omitted by Bingham in his volume, and (*b*) all available references to important papers published since 1897 containing notes of a biological or taxonomical nature on the various Indian species of wasps and bees.

The original idea in preparing this catalogue was to have a reference card index for private use; but it struck me later that the list, in spite of the several drawbacks it is bound to contain, might, if published, be of some use to other workers in the same field. Situated as I am far away from any large entomological

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library or a good named collection, it is quite possible that the list may be incomplete in various ways. The recent papers of well-known specialists like Turner, Meade Waldo, Cockerell, etc., also show that many new names, especially those of the late Cameron, are synonyms. All the same, for reference purposes I believe the list cannot but be of some use. The catalogue does not pretend to be complete with regard to the references to papers published after 1912, although all available ones up to date have been included.

In the arrangement of families and genera I have followed Bingham and with regard to the species of genera including more than one they have been arranged, as far as possible, in chronological order.

Abbreviations.

Abh. Senekeneb. Ges.—Abhandlungen herausgegeben von der Senekenbergischen naturforschenden Gesellschaft, Frankfort, A. M.

Allg. Zeits. Ent.—Allgemeine Zeitschrift für Entomologie, Neudamm.

Ann. K. K. Hoff. Wien.—Annalen des K.-K. naturhistorischen Hofmuseums, Vienna.

A. M. N. H.—Annals and Magazine of Natural History, London.

Ann. Museo Civ. Gen.—Annale del Museo civico di Storia Naturale de Genoa, Genoa.

Ann. Mus. Hung.—Annales Historie Naturale Musei Nation Hungary, Budapesth.

Ann. Soc. Ent. Fr.—Annales de la Societe entomologique de France, Paris.

Archives. Naturge.—Archiv für Naturgeschichte, Berlin.

Ark. Zool.—Arkiv für Zoologi, Stockholm.

Berl. Ent. Zs.—Berliner Entomologische Zeitschrift, Berlin.

Boll. Mus. Tori.—Bolletino dei Musei dei Zoologia, etc., Torino, Torino.

B. J.—Bombay Natural History Society's Journal, Bombay.

Bull. Soc. Ent. Fr.—Bulletin de la Societe Entomologique de France, Paris.

Canad. Ent.—Canadian Entomologist, London (Ontario).

D. Ent. Z.—Deutsche Entomologioche Zeitschrift, Berlin.

Ent. Mag.—Entomologist's Monthly Magazine, London.

Ent. News.—Entomological News, Philadelphia.

Ent. Record.—Entomologist's Record and Journal of Variation, London.

Faun. Mald.—Fauna Maldivense, Cameron (in Gardiner's Fauna and Geography of the Maldive and Laccadives Archipelagoes, Part. i, pp. 51-63, 1902).

F. B. I. I.—Fauna of British India, Hymenoptera by Bingham, Vol. i, 1897.

Illustr. Zeits. Ent.—Former name of Allg. Zeits. Ent., Neudamm.

Ind. For. Rec.—Indian Forest Records, Forest Research Institute, Dehra Dun, India.

Ind. Ins. Life.—Indian Insect Life, by Lefroy, Thacker Spink, Calcutta, 1909.

Jahr. Ver. Wies.—Jahrbucher de Nassanischen Vereins für Naturkunda Wiesbaden.

J. A. S. B.—Journal of the Assiatic Society of Bengal, Calcutta.

Jour. N. Y. Ent. Soc.—Journal of the New York Entomological Society, New York.

Jour. Linn. Soc.—Journal of the Linnæn Society (Zoology,) London.

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Mem. Manch. Soc.—Memoirs and Proceedings of the Manchester Literary and Philosophical Society, Manchester.

Mem. Deptt. Agr. India.—Memoirs of the Department of Agriculture, India, Calcutta.

Proc. Ent. Soc. Wash.—Proceedings of the Entomological Society of Washington, Washington.

Proc. Haw. Ent. Soc.—Proceedings of the Hawiian Entomological Society.

Proc. U. S. Nat. Mus.—Proceedings of the United States National Museum, Washington.

P. Z. S.—Proceedings of the Zoological Society of London, London.

Rec. Ind. Mus.—Records of the Indian Museum, Calcutta.

Rev. Rves. Ent.—Revue Russe d'Entomologie, St. Petersburg.

Sitz. K. Akd. Wiss. Wien.—Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften, Vienna.

Smith. Cat.—Catalogue of the Hymenoptera, in the British Museum, F. Smith, London.

Spol. Hym.—Spolia Hymenopterologica, Schulz, 1906.

Spin. Insec. Ligur.—Insectorum Liguræ, Spinolacte 1806.

Soc. Ent. Stegl.—Societas Entomologica, Zurich and Steglitz.

Spol. Zeyl.—Spolia Zeylanica, Colombo, Ceylon.

Stett. Ent. Zt.—Stettiner Entomologische Zeitung, Stettin.

Term. Fuz.—Termeszetrajzi Fuzetek Magyar Museum, Budapesth.

Tijdchr. Ent.—Tijdchrift Voor Entomologie, Hague.

Tr. Amer. Ent. Soc.—Transactions of the American Entomological Society, Philadelphia.

T. E. S.—Transactions of the Entomological Society of London.

T. Z. S.—Transactions of the Zoological Society of London.

Verh. Ges. Wien.—Verhandlungen der K. K. Zoologische—botanischen Gesellschaft in Wien., Vienna.

Zeit. Hym. Dipt.—Zeitschrift für syst. Hymenopterologie and Dipterologie, Teschendorf.

Zs. Wiss. insektbiol.—Zeitschrift für Wissenschaft insektenbiologie, Berlin.

Zool. Jahrb.—Zoologische Jahrbücher, Jena.

FOSSORES.

MUTILLIDÆ.

Classification of the family.—Ashmead. Canad. Ent., XXXV., p. 205, 1903.
Table of Mutillids.—Ashmead, p. 48, Journ. N. Y. Ent. Soc., VII., 1899.

APTERYGONA.

Apterygona and its allies, Saunders, p. 228, Ent. Mag., 1899.

MUTILLA.

M. intermedia, Sauss,* p. 354, Ann. Soc. Ent. Fr., 1867, Ceylon.
M. confuci, Andre,* p. 10, Termes Fuzitek, XIX, 1896, East India.
M. substituta, Andre,* p. 11, do. do.
M. semiviolacea, Andre,* p. 17, do. Himalayas.
M. aedipus, Cameron (apterous ♂), p. 53, pl. iv., fig. 13, Mem. Manch. Soc., XLI (4), 1897, Barrackpore.
M. apicipennis, Cameron, p. 55, Mem. Manch. Soc. XLI (4), 1897, Ceylon.
M. acidalia, Cameron, p. 56, Mem. Manch. Soc. XLI (4), 1897, Ceylon.

* Spp. described before 1897, but omitted by Bingham in his book. (Spp. *underlined* are those already described in Bingham's book.)

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M. acidalia, Notes on, Cameron, p. 331, A. M. N. H., XI, 1903.

M. opulenta, Smith. ♀, Cameron, p. 57, Mem. Manch. Soc., XLI (4), 1897.

This is probably same as *M. sorror* (Bingham, F.B.I., i., p. 12), Cameron, p. 57, Mem. Manch. Soc. XLI (4), 1897.

M. indefensa, Cameron, ♂, p. 62, Mem Manch. Soc., XLI (4), 189 , Bombay.

M. luxuriosa, Cameron, ♀, p. 67, Mem. Manch. Soc., XLI (4), 1897, Ceylon.

M. humilis, Cameron, ♀, p. 72, Mem. Manch. Soc., XLI (4), 1897, Barrackpore.

M. laeta, Cameron, ♀, p. 72, Mem. Manch. Soc., XLI (4), 1897, Barrackpore.

M. ariel, Cameron, ♀, p. 74, Mem. Manch. Soc., XLI (4), 1897, Barrackpore.

M. peregrina, Cameron, ♀, p. 76, Mem. Manch. Soc., XLI (4), 1897, Barrackpore.

M. fumipennis, Bingham, ♂, p. 118, pl. A., fig. 6, B. J., XII, 1898, Deesa.

M. visrara, Cameron, ♀, p. 1, Mem. Manch. Soc., XLII (11), 1898, Trincomale, Ceylon.

M. simplicata, Cameron, ♀, p. 5, Mem. Manch. Soc., XLII (11), 1898, Ceylon.

M. posthuma, Cameron, ♀, p. 8, Mem. Manch. Soc., XLII (11), 1898, Ceylon.

M. consociata, Cameron, ♀, p. 9, Mem. Manch. Soc., XLII (11), 1898, Ceylon.

M. indecora, Cameron, ♀, p. 10, pl. iv., fig. 1, Mem. Manch. Soc., XLII (11), 1898, Ceylon.

M. ernesti, Cameron, ♀, p. 12, Mem. Manch. Soc., XLII (11), 1898, Ceylon,

M. litigiosa, Cameron, ♀, p. 13, Mem. Manch. Soc., XLII (11), 1898, Ceylon.

M. fallaciosa, Cameron, ♀, p. 14, Mem. Manch. Soc., XLII (11), 1898, Ceylon.

M. stulta, Cameron, ♀, p. 16, Mem. Manch. Soc., XLII (11), 1898, Ceylon.

M. auronotota, Andre, ♂, ♀, p. 21, Ann. Soc., Ent. Fr., LXVII, 1898, Karachee.

M. pauli, Andre, ♂ ♀, p. 23, Ann. Soc., Ent. Fr., LXVII, 1898, Karachee.

M. spinulosa, Andre, ♀, p. 26, Ann. Soc., Ent. Fr., LXVII, 1898, Cochin, Karachee, Poona, etc.

M. pusilla.

M. pusilla, Smith, Cat. III, p. 37, 1855.

M. pusilla, Bingham, p. 38, F. B. I., i, 1897.

M. frederici, Andre, p. 20, Ann. Soc., Ent. Fr., 1898.

M. aestuans, Gerst, Sexes, Bingham, p. 101, B. J., XII, 1898.

M. bidens, Cameron, ♂, p. 59, A. M. N. H., IV, 1899, Barrackpore.

M. cona, Cameron, ♂, p. 60,	do.	do.	do.
M. selma, Cameron, ♂, p. 62,	do.	do.	Mussouri.
M. fortinata, Cameron, ♂, p. 63,	do.	do.	Barrackpore.
M. lena, Cameron, ♂, p. 64,	do.	do.	do.
M. fianna, Cameron, ♂, p. 65,	do.	do.	do.
M. cara, Cameron, ♂, p. 66,	do.	do.	do.
M. zodiaca, Cameron, ♂, p. 67,	do.	do.	Allahabad.

M. empirica, Cameron, ♂, p. 1, Mem. Manch. Soc., CLIV (15), 1900, Khasia Hills.

M. antera, Cameron, ♂, p. 3,	do.	do.	do.
M. perdita, Cameron, ♂, p. 4,	do.	do.	do.

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M. pandara, Cameron, ♂, p. 6	Mem. Manch. Soc., CLIV (15), 1900,		Khasia Hills.
M. isora, Cameron, ♂, p. 8	do.	do.	do.
M. responsaria, Cameron, ♂, p 9	do.	do.	do.
M. onara, Cameron, ♂, p. 11	do.	do.	do.
M. honorata, Cameron, ♂, p. 12	do.	do.	do.
M. elmira, Cameron, ♂, p. 14	do.	do.	do.
M. aglaia, Cameron, ♂, p. 16	do.	do.	do.
M. lyrata, Cameron, ♂, p. 17	do.	do.	do.
M. lathonia, Cameron, ♂, p. 18	do.	do.	do.
M. lepcha, Cameron, ♂, p. 19	do.	do.	do.
M. khasiana, Cameron, ♂, p. 20	do.	do.	do.
M. niobe, Cameron, ♂, p. 22	do.	do.	do.
M. coeruleotincta, Cameron, ♂, p. 23	do.	do.	do.
M. montanata, Cameron, ♂, p. 24	do.	do.	do.
M. amitina, Cameron, ♀, p. 26	do.	do.	Ceylon.
M. consolidata, Cameron, ♀, p. 26	do.	do.	do.
M. redacta, Cameron, ♀, p, 28	do.	do.	Barrackpore.
M. agelia, Cameron, ♀, p. 29	do.	do.	do.
M. mithila, Cameron, ♀, p. 30	do.	do.	do.
M. dryta, Cameron, ♀, p.31,	Mem. Manch. Soc., XLIV(15),1900,		do.
M. compactilis, Cameron, ♀, p. 32	do.	do.	do.
M. martialis, Cameron, ♀, p. 33	do.	do.	do.
M. tirhootensis, Cameron, ♀, p. 34	do.	do.	Tirhoot (Bengal).
M. violenta, Cameron, ♀, p. 35	do.	do.	Ceylon.
M. pamphia, Cameron, ♀, p. 35	do.	do.	Barrackpore.
M. marcia, Cameron, ♀, p. 37	do.	do.	do.
M. gnoma, Cameron, ♀, p. 38	do.	do.	do.
M. emancipata, Cameron, ♀, p. 39	do.	do.	do.
M. phaola, Cameron, ♀, p. 40	do.	do.	Poona.
M. edolata, Cameron, ♀, p. 41	do.	do.	Ceylon.
M. hesitata, Cameron, ♀, p. 42	do.	do.	do.
M. parthenia, Cameron, ♀, p. 42	do.	do.	Barrackpore.
M. persuasa, Cameron, ♀, p. 43	do.	do.	Ceylon.
M. recondita, Cameron, ♀, p. 44	do.	do.	do.
M. aspera Cameron, ♀, p. 45.	do.	do.	do.
M. indocila, Cameron, ♀, p. 47	do.	do.	do.
M. lethargia, Cameron, ♀, p. 48	do.	do.	Barrackpore.
M. foveiscutis, Cameron, ♂, p. 49	do.	do.	Poona.
M. quadricarinata, Cameron, ♂, p. 51	do.	do.	Barrackpore.
M. cressida, Cameron, ♂, p. 52	do.	do.	Ceylon.
M. phaenna, Cameron, ♂, p. 54	do.	do.	Barrackpore.
M. idyia, Cameron, ♂, p. 55	do.	do.	do.
M. sabellica, Cameron, ♂, p. 56	do.	do.	do.
M. labiena, Cameron, ♂, p. 58	do.	do.	do.
M. morna, Cameron, ♂, p. 60	do.	do.	Tirhoot (Bengal).
M. funebrana, Cameron, ♂, p. 61	do.	do.	Barrackpore.
M. serena, Cameron, ♂, p. 63	do.	do.	do.
M. cleonyma, Cameron, ♂, p. 64	do.	do.	do.
M. maculicornis, Cameron, ♂, p. 65	do.	do.	do.
M. poesia, Cameron, ♂, p. 67	do.	do.	do.
M. ludovica, Cameron, ♂, p. 68	do.	do.	do.
M. oglana, Cameron, ♂, p. 70	do.	do.	Ceylon.
M. illa, Cameron, ♂, p. 71	do.	do.	Barrackpore.

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M. foveata, Cameron, ♂, p. 72, Mem. Manch. Soc., XLIV (15), 1900, Ceylon.
M. erxia, Cameron, ♂, p. 74 do. do. Barrackpore.
M. regia, Smith, Cameron, ♂, p. 271, pl. fig. 8 & 9, B. J., XIV, 1902.
Do. do. *var fusca*-Andre, p. 35, Ann. Soc., Ent. Fr., 1898, Karachee.
M. sonata, Nurse, ♂, p. 79, pl. fig. 2, B. J. XIV, 1902, Simla.
M. kallala, Nurse, ♂, p. 80, pl. fig. 1 do. do. Deesa.
M. ekka, Nurse, ♀, p. 80, pl. fig. 4 do. do. do.
M. chota, Nurse, ♀, p. 80, pl. fig. 3 do. do. Simla.
M. climia, Cameron, ♂, p. 267 do. do. Deesa.
M. acasta, Cameron, ♂, p. 269 do. do. Simla.
M. diomeda, Cameron, ♂, p. 270 do. do. do.
M. philippa, Nurse, ♂, p. 394, A. M. N. H., XI, 1903, Deesa.
M. adscripta, Nurse, ♀, p. 396 do. do. do.
M. vincula, Nurse, ♀, p. 398 do. do. do.
M. argentomaculata, Smith—Notes on sexual characters.
Nurse—p. 397, A. M. N. H., XI, 1903.
M. aversa, Nurse, ♀, p. 397, A. M. N. H., XI, 1903, Deesa.
M. optima, Smith, ♂, Nurse, p. 398, do. do. do.
M. malinka, Nurse, ♀, p. 399 do. do. do.
M. officia, Nurse, ♂, p. 399 do. do. do.
M. kraciva, Nurse, ♂, p. 400 do. do. do.
M. vesta, Nurse, p. 24, B. J., XVI, 1904, Kangra Valley.
M. inoa, Cameron, p. 279, A. M. N. H., XIII, 1904, N. India.
M. artaxa, Cameron, p. 280 do. do. Simla.
M. trebia, Cameron, p. 280 do. do. N. India.
M. sceva, Cameron, p. 6, Zeits. Hym. Dipt., IV, 1904, Khasia Hills.
M. gnatia, Cameron, p. 7 do. do. do.
M. tiza, Cameron, p. 8, do. do. do.
M. horni, Andre, p. 254, D. Ent. Z., 1907, Sigiri (Ceylon).
M. aurofasciata, Andre, p. 255 do. Pankulam (Ceylon).
M. albopunctata, Andre, p. 256 do. Nalanda (Ceylon).
M. indostana, Smith (♀ described for the first time)
Wickwar, p. 118, fig. 6, Spol Zeyl., V, 1908, Ceylon.
M. willeyi, Wickwar, ♀, p. 119, fig. 7, do. do. do.
M. spectra, form new, Bingham, p. 350, Rec. Ind. Mus., II, 1908, India.
M. indiga, form new, Bingham, p. 351 do. do. India.
M. ianthis, Turner, p. 144, Spol. Zeyl., VII, 1911, Ceylon.
M. bainbriggei, Turner. p. 144 do. do. do.
M. porcella, Turner, p. 145 do. do. do.
M. pinguicula, Turner, p. 146 do. do. do.
M. thermophila, Turner, p. 146 do. do. do.
M. fumigata, Turner, p. 147, do. do. do.
M. fletcheri, Turner, p. 147 do. do. do.
M. wickwari, Turner, p. 148 do. do. do.
M. desiderata, Turner, p. 148 do. do. do.
M. melanota, Turner, p. 150 do. do. do.

Odontomutilla.

O. sikkimensis, Andre, p. 426, Ann. Soc. Ent. Fr., 1903, Sikkim.

Rhopalomutilla.

R. japhia.
Mutilla japhia, Cameron, p. 268, B. J., XIV, 1902, Deesa.
Rhophalomutilla japhia, Andre, p. 426, Ann. Soc., Ent. Fr., 1903.

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SPILOMUTILLA.

S. eltola.
Mutilla eltola, Cameron, p. 3, Mem. Manch. Soc., XLII, (11) 1898, Anurudhapura (Ceylon).
Spilomutilla eltola, Andre, p. 251, D. Ent. Z., 1907.
Do. *do.* Turner, p. 141, Spol. Zeyl., VII, 1911.

PROMECILLA.

P. praestabilis, Andre, p. 283, D. Ent. Z., 1907, Anurudhapura (Ceylon).
P cyanosoma, Turner, p. 151, Spol. Zeyl. VII, 1911, Ceylon.
P. metallica.
Mutilla metallica, Cameron, p. 120, Mem. Manch. Soc. (4), V, 1882.
Promacella metallica, Andre, p. 252, D. Ent. Zs., 1907, Ceylon.

DASYLABRIS.

D. Nursei.
Mutilla suspecta, Nurse, p. 395, A. M. N. H., XI, 1903.
Dasylabris Nursei, Andre, p. 427, Ann. Soc. Ent. Fr., 1903, Deesa.

List of Ceylon Mutillids, Andre, p. 251, D. Ent. Zs., 1907. (Some known Species are also referred 20 here.)

THYNNIDÆ.

Classification of Thynnidæ—Ashmead, p. 95, Canad. Ent., XXXV, 1903.
Notes on the genera of Thynnidæ—Turner, p. 63, T. E. S., 1908.
Genera and species of Thynnidæ—Turner, Genera Insectorum, 1910.

METHOCA.

M. violaceipennis, Cameron, p. 68, A. M. N. H., IV, 1899, Khasia Hills.
Do.—larva; parasite on Cicindela—Bouwman, p. 110, Levende Natuur, Am sterdam, 1908.
M. ichneumonoides, Latr. Life history and habits of—Adlerz ; Arkiv. Zool. III (4), 1906.

ISWARA.

Iswara and allies—Turner, p. 476, A. M. N. H., 1909.

SCOLIIDÆ.

Notes on Scoliidæ—Turner, p. 476, A. M. N. H. III, 1909.

TIPHIA.

T. tarsata, Cameron, p. 44, Mem. Manch Soc. XLI (4), 1897, Mussouri.
T. magrettii, Cameron, p. 45, do. do. do. do.
T. clypealis.
T. flavipennis, Bingham, p. 59, F. B. I., i ; 1897.
T. clypealis, Cameron, p. 47, Mem. Manch. Soc., XLI (4), 1897, Mussouri.
T. quinquecarinata, Cameron, p. 288, A. M. N. H., XIII, 1904.
T. clypealis, Turner, p. 124, A. M. N. H., II, 1908.
T. fulvohirta, Cameron, p. 17, Mem. Manch., Soc., XLII (11), 1898. Poona.
T. petri.
T. brevipennis, Cameron, p. 17, A. M. N. H., V., 1900, Barrackpore.
T. petri, Turner, p. 128, A. M. N. H., II, 1908.
T. polycarinata.
T. policarinata, Magr., p. 250, Ann. Mus. Civ. Gen. (2a), XII, 1892.

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T. erythrocera, Cam., Mem. Manch. Soc., XLI, 1897, Mussouri.
T. concisa, Nurse, p. 81, B. J., XIV, 1902.
T. polycarinata, Turner, p. 124, A. M. N. H., II, 1908.
T. decrescens. *
T. decrescens, Walker, p. 376, A. M. N. H., IV, 1859.
T. sub laevigata, Magr., p. 254, Ann. Mus. Civ. Gen. 2a, XII, 1892, Deesa.
T. nervosa, Nurse, p. 81, B. J., XIV, 1902.
T. decrescens, Turner, p. 125, A. M. N. H., II, 1908.
T. spinosa, Cameron, p. 237, Entomologist, 1902, Khasia Hills.
T. auripennis.
T. auripennis, Bingham, p. 64, F. B. I., i, 1897.
T. curvinervis, Cam., p. 238, Entomologist, 1902, Khasia Hills.
T. fulvinerva, Cam., p. 286, A. M. N. H., XIII, 1904.
T. auripennis, Turner, p. 120, A. M. N. H., II, 1908.
T. khasiana, Cameron, p. 86, A. M. N. H., X, 1902, Assam.
T. canaliculata, Cameron, p. 87, do. do. do.
T. exacta, Nurse, p. 400, A. M. N. H., XI, 1903, Kashmir.
T. rothneyi, Cameron, p. 324, do. do. Assam.
T. clavinerva, Cameron, p. 281, A. M. N. H., XIII, 1904, N. India.
T. himalayensis, Cameron, p. 282, do. do. do.
=*T. fumipennis*, *Magr.* var (a) Turner, p. 121, A. M. N. H., II, 1908.
T. robusta, Cameron, p. 283, A. M. N. H., XIII, 1904, N. India.
T. denticula, Cameron, p. 284, do. do. do.
T. tuberculata, Cameron, p. 285, do. do. do.
T. simlensis, Cameron, p. 287, do. do. Simla.
T. compressa, Smith, Turner, p. 118, A. M. N. H., II, 1908.
T. rufipes, Smith, Turner, p. 119, do. do.
T. intrudens, Smith, Turner, p. 123, do. do.
T. rufofemorata.
T. rufofemorata, Smith, p. 183, Cat., iii.
T. rufofemorata, Cameron, p. 115, Mem. Manch. Soc., V (4), 1892.
T. cassiope, Cameron, p. 59, do. do. do. XLI, 1897.
T. rufofemorata, Turner, p. 482, A. M. N. H., III, 1909.
T. oswini, Turner, p. 152, Spol. Zeyl., VII, 1911, Calcutta.
T. femorata, Fab. Life History, Adlerz., p. 21, Ark., Zool., 1911.

MYZINE.

M. bengalensis, Cameron, p. 20, Mem. Manch. Soc., XLII, 11, 1898, Poona.
M. apimacula, ♀, Cameron, p. 272, B. J., XIV, 1902.
Do. ♂, Nurse, p. 401, A. M. N. H., XI, 1903, Deesa.
M. rothneyi, Cameron, p. 88, A. M. N. H., X, 1902, Assam.
M. subpetiolatus.
Plesia subpetiolatus, Cameron, p. 135, B. J. XVIII, 1907.
Myzine do. Turner, p. 478, A. M. N. H., III, 1909, Quetta.
M. baluchistanensis.
Plesia baluchistanensis, Cameron, p. 134, B. J., XVIII, 1907, do.
Myzine do. Turner, p. 479, A. M. N. H., III, 1909.
M. binghami, Turner, p. 501, A. M. N. H., I, 1908, Lower Burma.
M. dimidiaticornis, Bingh., Turner, p. 501, A. M. N. H., I, 1908.
M. clavicornis, Turner, p. 476, A. M. N. H., III, 1909, Deesa.
M. albomaculata.
Pœcilotiphia albomaculata, Cameron, p. 274, pl. fig. 6, B.J., XIV, 1902.
Myzine do. Turner, p. 479, A.M.N.H., III, 1909, Deesa.

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Note on Pœcilotiphia, Turner, p. 131, A. M. N. H., II, 1908.
The Genera Myzine and Plesia, Turner, p. 497, A. M. N. H., I, 1908.

SCOLIA.

S. pila, Nurse, ♂, p. 82, fig. 5, B. J., XIV, 1902, Deesa.
Do. do. ♀, p. 401, A. M. N. H., XI, 1903.
S. vivida, Smith, Nurse, p. 402, A. M. N. H., XI, 1903, Deesa.
S. erythrotrichia, Cameron, p. 9, Zeits. Hym. Dipt., IV, 1904, Deesa and Simla.
S. quettaensis, Cameron, p. 136, B. J., XVIII, 1907, Quetta.
S. maura, F., Cameron, do. do. do.
Scolia, Synonymy and variation, Turner, p. 619, A. M. N. H., VIII, 1911.

DISCOLEA.

D. erythropoda, Cameron, p. 323, A. M. N. H., XI, 1903, Khasia.
D. nigrobimaculata, Cameron, p. 300, B. J., XVIII, 1908, Deesa.

ELIS.

E. thoracica, Sauss ♂. Cameron, p. 55, Fauna Maldivensis, 1902, Maldives.
E. rubricata, Nurse, p. 402, A. M. N. H., XI, 1903. Deesa.
Elis-Synonymy, Ashmead, p. 8, Canad, Ent., XXXV, 1903.
Elis-name, transferred to Plesia and replaced by Campsomeris-Turner, p. 165, A. M. N. H., IV, 1909.
Elis, key to the Oriental spp., Turner, p. 713, P. Z. S., Pt. III, 1912.

MEIRA.

M. quadrimaculata, Cameron, p. 274, pl. fig. 5, B. J., XIV, 1902, Deesa.
A note on *M. quadrimaculata*, Cameron, p. 90, Zeit. Hym. Dipt., IV, 1904.

PLESIA.

P. madraspatana.
Myzine madraspatana, Smith, p. 72, Cat., III, 1855, ♀.
Myzine violaceipennis, Cameron, p. 21, Mem. Manch. Soc., XLII (11), 1898, ♀.
Plesia madraspatana, Turner, p. 507, A. M. N. H., I, 1908. (Turner thinks this to be the ♀ of Myzine dimidiata, Guer).
P. dimidiata.
Myzine dimidiata, Guer, p. 575, Dict. pitt. d'Hist Nat., V, ♂.
Methoca orientalis, Smith, p. 66, Cat., III, 1855, ♂.
Plesia dimidiata, Turner, p. 508, A. M. N. H., I, 1908.
P. opacifrons, Turner, p. 509, A. M. N. H., I, 1908, Tennaserim.
P. ustulata, Turner, p. 510, do. do. do.
P. extensa, Turner, p. 511, do. do. Burma.
P. petiolata.
Myzine petiolata, Smith, p. 72, Cat., III, 1855, ♂.
Myzine ceylonica, Cameron, p. 18, A. M. N. H., V, 1900, ♀.
Plesia petiolata, Turner, p. 512, A. M. N. H., I, 1908.
P. hortata,
Myzine hortata, Nurse, p. 51, pl., fig. 6, B. J., XIV, 1902.
Plesia hortata, Turner, p. 512, A. M. N. H., I, 1908, Deesa.
P. nursei, Turner, p. 480, A. M. N. H., III, 1909, Simla.
The Genera Plesia and Myzine, Turner, p. 497, A. M. N. H., I, 1908.

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POMPILIDÆ.

Classification of the family—Ashmead, Canad, p. 149, Ent., XXXII, 1900.

Pseudagenia.

P. glabra, Bingham, p. 118, B. J., XII, 1898, Sikkim.
P. arethusa, Cameron, p. 20, P. Z. S., Pt. II, 1901, Khasia.
P. morna, Cameron, p. 213, A. M. N. H., IX, 1902, Bengal.
P. muta, Cameron, p. 214, do. do. Barrackpore.
P. erythropoda, Cameron, p. 66, A. M. N. H., X, 1902, Assam, Sikkim Madras.
P. montanata, Cameron, p. 67, do. do. Assam.
P. gnoma, Cameron, p. 67, do. do. do.
P. excellens, Cameron, p. 68, do. do. do.
P. mutilata, Nurse, p. 403, A. M. N. H., XI, 1903, Deesa.
P. lepcha, Cameron, p. 291, A. M. N. H., XIII, 1904, Simla.
P. languida, Cameron, p. 416, A. M. N. H., XV, 1905, Khasia Hills.
P. pulchrifrons, Cameron, p. 417, A. M. N. H., XV, 1905, Khasia Hills.
P. lyrata, Cameron, p. 418, A. M. N. H., XV, 1905, Khasia Hills.
P. nigritibiis, Cameron, p. 418, A. M. N. H., XV, 1905, Khasia Hills.
P. agitata, Cameron, p. 419 do. do. do.
P. assamensis, Schulz, p. 165, Spol. Hym., 1906.
P. flavicollis, Cameron, p. 419, A. M. N. H., XV, 1905, do.
P. nigripalpis, Cameron, p. 420 do. do. do.
P. lacteipennis, Cameron, p. 421 do. do. do.
P. purpurea, Cameron, p. 422 do. do. do.
P. prophetica, Cameron, p. 422 do. do. do.
P. himalayensis, Cameron, p. 423 do. do. do.
P. bidens, Cameron, p. 383, Entomologist, 1908, Sikkim.
P. culiciformis, Bingham, *form new*, p. 353, Rec. Ind. Mus., II, 1908, India.
P. invidiosa, Bingham, *form new*, p. 354 do. do. do. do.
P. mimica, Bingham, *form new*, p. 354 do. do. do. do.

A key to Khasia species of Pseudagenia—Cameron, p. 416, A. M. N. H., XV, 1905.

Agenia.

A. diana, Cameron, p. 19, A. M. N. H., V, 1900, Khasia.

Salius.

S. leptocerus, Cameron, p. 17, Mem. Manch. Soc., XLI (13), 1897, Sikkim.
S. taporbane, Cameron, p. 23, P. Z. S., Pt. II, 1901, Ceylon.
S. himalayensis, Cameron, 240, Entomologist, 1902, Khasia Hills.
B. intimellus, Cameron, p. 77, A. M. N. H., X, 1902, Assam.
S. khasianus, Cameron, p. 78, do. do. do.
S. assamensis, Cameron, p. 78, do. do. do.
S. junctellus, Cameron, p. 79, do. do. do.
S. curvinervis, Cameron, p. 80, do. do. do.
S. brevipennis, Cameron, p. 81, do. do. do.
S. avidus, Nurse, p. 403, A. M. N. H., XI, 1903, Mt. Abu.
S. trichiosoma, Cameron, p. 289, A. M. N. H., XIII, 1904, N. India.
S. frederici, Cameron, p. 290, do. do. do.
S. lugubrinus, Cameron, p. 291, do. do. do.
S. œneus, Cameron, p. 10, Zeits. Hym. Dipt., IV, 1904, Sikkim.
S. fluctuatus, Cameron, p. 474, A. M. N. H., XV, 1905, Khasia Hills.
S. Frederici, Cameron, p. 474, do. do. do.

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Name changed to S. petri, Schulz, p. 167, Spol. Hymenopt, 1906.
S. saturnalis, Cameron, p. 475, A. M. N. H., XV, 1905, Khasia Hills.
S. tempestivus, Cameron, p. 476, do. do. do.
S. proecursor, Cameron, p. 477 do. do. do.
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P. certator, Nurse, p. 83, fig. 11, B. J., XIV, 1912, Deesa.
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P. brutus, Nurse, p. 84, do. do. do.
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P. eanes, Cameron, p. 280, do. do. do.
P. sollicitnas, Cameron, p. 281, do. do. do.
P. alcacus, Cameron, p. 282, do. Deesa, do.
P. caroli, Cameron, p. 282, do. do. do.
P. halys, Cameron, p. 283, do. do. do.
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P. oedilus, Cameron, p. 468, do. do. do.
P. stimulatus, Cameron, p. 468, do. do. do.
P. ardescens, Cameron, p. 469, do. do. do.
P. lictor, Cameron, p. 470, do. do. do.
P. tyres, Cameron, p. 470, do. do. do.
P. fortinatus, Cameron, p. 471, do. do. do.
P. delphus, Cameron, p. 471, do. do. do.
P. addendus, Cameron, p. 472, do. do. do.
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A. interstitialis, Cameron, p. 1010, B. J., XVII, 1907, Deesa.
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N. indica, Cameron, p. 120, do. do. do.
N. striaticollis, Cameron, p. 121, do. do. do.
N. varipilosa, Cameron, p. 122, do. do. do.
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N. khasiana, Cameron, p. 225, do. do. do.
N. vivax, Cameron, p. 226, do. do. do.
N. tegularis, Cameron, p. 226, do. do. do.
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N. strenua, Cameron, p. 228, do. do. do.
N. sulcifrons, Cameron, p. 228, do. do. do.

* Omitted by Bingham, probably a Notogonia or Larra.
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† New to the region.

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P. kashmirensis, Nurse, p. 520, A. M. N. H., XI, 1903, Kashmir.
P. refractus, Nurse, p. 11, B. J., XV, 1903, Mt. Abu.

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THE BIRDS OF LAHORE AND THE VICINITY.

BY

A. J. CURRIE.

It is with some diffidence that I set myself to give some account of the birds found at Lahore, as I fear that the list will be found far from complete. As I have only recently made use of a collecting gun, there are of necessity several species of whose identity I am far too doubtful to include them here, and others which I have included under a reservation as I did not shoot the bird and so totally include the possibility of mistake, though tolerably certain in my own mind of their identity. However, I have made it clear, whenever there is any doubt. I only hope that the list may prove of use to ornithologists coming to this part of the Punjab for the first time, and may stimulate them and others to fill in the numerous gaps. That the avifauna of the Punjab has changed since the "Fauna of British India" was written, I think there will be found evidence below, and I attribute this change in especial measure to the large increase in irrigation in the Punjab in recent years.

I have included here birds seen at Atari and Muridke as these places are frequently visited by sportsmen from Lahore.

Atari is 17 miles from Lahore to the south-west on the road to Amritsar, and Muridke is a corresponding distance to the north-west on the grand trunk road to Rawalpindi.

There are several jhils both at these places and on the road thereto which constitutes the nearest places to Lahore where water birds may be found.

My observations extended intermittently over a period of six years.

The numbering and nomenclature are those given in the "Fauna of British India."

1. The Raven—*Corvus corax*.

Breeds at Lahore, Atari and Muridke in January and February and most nests will be found to contain young in March. Fairly plentiful everywhere and apparently resident.

5. The Rook—*Corvus frugilegus*.

Large flocks seen at Atari during the cold weather. The only recorded date is in January.

7. The Indian House-Crow—*Corvus splendens*.

Very common at Lahore and a permanent resident. It commences to breed there in June.

9. The Jackdaw—*Corvus monedula*.

Large flocks seen at Atari during the cold weather in company with flocks of rooks. The only recorded date is in January.

16. The Indian Tree-pie—*Dendrocitta rufa*.

A common resident. Breeds March to June, but chiefly in April at Lahore.

31. The Indian Grey Tit—*Parus atriceps*.

A cold weather visitor from October to March, but not in large numbers.

105. The common Babbler—*Argya caudata*.

Very common permanent resident. Breeds May to September, chiefly in June.

110. The Jungle Babbler—*Craterops canorus*.

Common resident. Starts breeding in April.

139. The Yellow-eyed Babbler—*Pyctorhis sinensis*.

A common resident. I have found nests in April, May and June.

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226. The Indian White-eye—*Zosterops palpebrosa.*
Fairly common and I think a resident. Breeds chiefly in April and also in May.

269. The Himalayan Black Bulbul—*Hypsipetes psaroides.*
I have myself come across a single individual on one occasion in the cold weather at Lahore, and have been told of other instances when it has been seen, but on the whole a rare straggler to Lahore in the cold weather.

283. The Punjab Red-vented Bulbul—*Molpastes intermedius.*
A very common permanent resident. Its nest may be found any time from April onwards in the hot weather at Lahore.

285. The White-eared Bulbul—*Molpastes leucotis.*
As Mr. Dewar has pointed out this bird is a cold weather visitor to Lahore arriving in October and leaving in March. Major Lindsay Smith tells me that this bird breeds at Lyalpur during the hot weather, and it may therefore possibly do so somewhere in the Lahore district, though I am quite certain that it deserts all its haunts in the vicinity of Lahore at that time.

327. The Black Drongo—*Dicrurus ater.*
A very common resident at Lahore where it breeds chiefly in May and June. I once saw several fully fledged young birds slightly marked with white on the cheeks, throat, edge of wing, abdomen and under tail coverts. I can confirm Mr. Dewar's observation that the nest of the Red Turtle Dove and Indian Oriole are frequently found in the same tree as the nest of this bird.

341. The Himalayan Tree-creeper—*Certhia himalayana.*
I have frequently seen this bird at Lahore in October, from which I presume it to be a cold weather visitor. Though it may only have been passing through then I think it unlikely.

363. The Indian Great Reed-warbler—*Acrocephalus stentoreus.*
I have seen and heard this bird in the vicinity of water at Lahore on the 17th April, the 6th May and the 20th October, from which it would appear that it passes through Lahore in small numbers on the spring and autumn migrations. I have recorded elsewhere that it breeds at Gurdaspur.

366. Blyth's Reed-warbler—*Acrocephalus dumetorum.*
This bird is most plentiful at Lahore in September and April when it is on migration and though some may remain during the cold weather I have not noticed them. It has very sweet low song in the spring.

374. The Indian Tailor-bird—*Orthotomus sutorius.*
A common permanent resident. I have found all my nests in May or early June.

381. The Rufous Fantail-warbler—*Cisticola cursitans.*
I am not sure whether this bird is a resident at Lahore, but it is found in the hot weather and breeds from July to September, *i.e.*, in the rains.

384. The Rufous-fronted Wren-warbler.—*Franklinia buchanani.*
This is one of the commonest resident warblers and its cheery song may be heard throughout the hot weather at Lahore in open country studded with low bushes. I have found nests in every month from the latter part of March to the beginning of September.

386. The long-tailed Grass warbler—*Laticilla burnesi.*
I have already sent an account of the breeding of this bird at Lahore to this Journal. It would appear to be a permanent resident and though I have only found nests in May I have seen fully fledged young birds in August. One nest which I watched under construction appeared

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to be built entirely by the cock bird and I never once saw the hen, which had no doubt met with some misadventure, and needless to say the nest never contained eggs. Another nest I found in the Ravi plantation was in the middle of a small clump of grass at the foot of a low shrub, in exactly such a silt as a nightingale might choose. I have not found this bird further north than Wazirabad.

392. The Bristled Grass-warbler—*Chætornis locustelloides.*

I have sent a separate account to this Journal of the breeding of this bird at Lahore. It appears to be only a migrant to Lahore in the monsoon and to breed in the grass rakh in August and possibly September.

402. The Indian Lesser White-throated Warbler—*Sylvia affinis.*

A fairly common cold weather visitor to Lahore where it arrives in the beginning of September and leaves by the end of April.

407. The Brown Willow-warbler—*Phylloscopus tristis.*

A common cold weather visitor to Lahore, arriving at the end of September and leaving towards the end of April, the latest date I have observed it being 3rd May. It is a great frequenter of farash trees and can be identified by its feeble imitation of the song of the Chiff Chaff which it utters with great persistency in the spring.

421. The Green Willow-warbler—*Acanthopneuste nitidus.*

I have only observed this bird at Lahore in October, but it probably passes through in the spring if it does not remain during the cold weather. In any case I do not think it is common.

422. The Large-crowned Willow-warbler—*Acanthopneuste occipitalis.*

I think I have seen this bird at Lahore in November, but as I did not shoot it I cannot be certain.

462. The Streaked Wren-warbler—*Prinia lepida.*

Rather local at Lahore though I fancy a resident. I have found nests in April and May. In voice, appearance and habits this bird so closely resembles the Indian Wren-warbler that it is almost impossible to distinguish them except in the hand, though the nest and eggs are an infallible guide.

464. The Ashy Wren-warbler—*Prinia socialis.*

A common permanent resident. I have found nests of both descriptions (*i. e.*, sewn in a leaf and of the ordinary kind) in every month from May to August.

466. The Indian Wren-warbler—*Prinia inornata.*

The commonest resident warbler. Breeds chiefly from June to September and I have found practically unmarked blue eggs, and eggs with the ordinary markings but with the ground colour white instead of blue.

469. The Indian Grey-shrike—*Lanius lahtora.*

A fairly common resident. Breeds from March to June, but chiefly in the former month.

473. The Bay-backed Shrike—*Lanius vittatus.*

A very common permanent resident. Breeds from March to July, chiefly in April and May.

476. The Rufous-backed Shrike—*Lanius erythronotus.*

I have seen this bird on three occasions during the hot weather at Lahore, but have never found its nest and doubt whether it can breed there. I do not remember having seen it during the cold weather (*i. e.*, earlier than April) and it is always scarce.

479. The Pale Brown shrike—*Lanius isabellinus.*

I have seen a shrike which I attributed to this species in September and March at Lahore. As, however, I did not shoot the bird, I cannot

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say with certainty. The bird I saw appeared to be too pale for *L. cristatus* nor to have the contrastive plumage of *L. phœnicuroides.*

488. The Common Wood-shrike—*Tephrodornis pondicerianus.*
Fairly common, permanent resident and breeds at Lahore in February and March, most nests containing young in April.

495. The Short-billed Minivet—*Pericrocotus brevirostris.*
A common and conspicuous winter visitor to Lahore. I have never seen it earlier than November or later than March.

500. The Small Minivet—*Pericrocotus peregrinus.*
Common permanent resident. Breeds in March and April, most nests having young in May.

518. The Indian Oriole—*Oriolus kundoo.*
Mr. Dewar has already pointed out in this Journal that this species is only a hot weather visitor to Lahore, a fact I am able to confirm. It arrives at the end of March or the beginning of April and departs in September. I have found nests in May, June and July, often in the same tree as a King Crow's nest and on one occasion in the same tree as a King Crow's and a Red Turtle Dove's nest.

528. The Rose-coloured Starling—*Pastor roseus.*
This bird passes through Lahore in large flocks during the first half of April, its spring migration lasting about a fortnight, and returns in the middle of July, the earliest recorded date being July 17th. Its return migration is far more leisurely and the flocks contain a large proportion of young birds. Scattered flocks may be met with now and then throughout the cold weather.

530. The Central-Asian Starling—*Sturnus porphryonotus.*
Though other species of Starling very likely visit the Punjab in the cold weather, this is the only one I have shot and can name with certainty. This is, I think, the Starling which is a common winter visitor to Lahore arriving in October and leaving in March.

544. The Black-headed Myna—*Temenuchus pagodarum.*
I once met with a single individual of this species at Lahore during the cold weather which I think may have been an escaped cage bird. If it occurs at all it is only as a rare straggler in the cold weather.

549. The Common Myna—*Acridotheres tristis.*
The commonest bird at Lahore and resident. It breeds from March to September occasionally in old Squirrel's and Crow's nests.

551. The Bank Myna—*Acridotheres ginginianus.*
Common and I think resident. It breeds in colonies in pits in the brick fields at Lahore in May and June.

561. The European Red-breasted Flycatcher—*Siphia parva.*
This is a not uncommon winter visitor to Lahore, arriving about the middle of October and leaving by the end of April; in which two months it is most plentiful.

592. The Grey-headed Flycatcher—*Culicicapa ceylonensis.*
I have seen this bird at Lahore in November and December but do not think that it is a regular winter visitor.

598. The Indian Paradise Flycatcher—*Terpsiphone paradisi.*
This is another species which I agree with Mr. Dewar in accounting only a hot weather visitor to Lahore. According to my observations it arrives in April and leaves in September and breeds in April and May.

604. The white-browed Fantail Flycatcher—*Rhipidura albifrontata.*
A common resident at Lahore breeding chiefly in April and May.

608. The Common Pied Bush-Chat—*Prantincola caprata.*
A common and permanent resident. Breeds chiefly in April but also in May and June.

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610. The Indian Bush Chat—*Pratincola maura.*

A common cold weather migrant to Lahore, arriving early in September and leaving at the end of April.

619. The White-headed Chat—*Saxicola capistrata.*

So far as I have been able to ascertain this bird is only a cold weather visitor to Lahore where it arrives in fair numbers in September. I have no record of its being found in other months and am certain that it does not breed round Lahore. I have also seen it at Pabbi (Peshawar) in August, Surar Gardaspur in September.

A specimen (cock) shot at Lahore in September had the crown a uniform greyish white and I personally have not seen a specimen at Lahore which could be attributed unquestionably to *S. picata*, the Pied Chat, which I do not think occurs at Lahore.

The matter however requires further investigation. At Dera Ghazi Khan in February where what I took to be this species was very plentiful. I saw birds with the crown pure white, white speckled with black, and black speckled with white, though the latter may possibly have been *S. picata.*

620. Strickland's Chat—*Saxicola opistholeuca.*

I have seen this bird on two occasions at Lahore and on one occasion at Jullundur in March. It appears to pass through Lahore in small numbers on the spring migration.

625. The Isabelline Chat—*Saxicola isabellina.*

I have seen this bird at Lahore in October and shot a male at Muridke in March. It appears to be a winter visitor in small numbers.

626. The Desert Chat—*Saxicola deserti.*

I have shot this bird at Muridke in March and seen it there also in February. Probably a winter visitor in suitable localities.

628. The Red-tailed Chat—*Saxicola chrysopygia.*

I once came across a pair of what I am nearly certain was this species on 3rd May at Lahore when they were probably on migration. Distinctly scarce.

629. The Brown Rock Chat—*Cercomela fusca.*

A common breeding species at Lahore and resident. I have found nests in May, June and July and it appears to breed in April as well.

644. The Indian Redstart—*Ruticilla rufiventris.*

A common cold weather visitor to Lahore, arriving the latter half of September and leaving towards the end of April.

On arrival the males appear to proceed the females by two or three weeks.

647. The Indian Blue-throat—*Cyanecula suecica.*

I have only records of this bird in Lahore in April, though I have seen it at Lyalpur in January and Peshawar in May. It is probably a winter visitor to Lahore in small numbers but escapes observation on account of its shy skulking habits.

661. The Brown-back Indian Robin—*Thamnobia cambaiensis.*

One of the commonest birds at Lahore and resident. I have found nests in every month from March to June at Lahore.

663. The Magpie Robin—*Copsychus saularis.*

A common resident. I have found nests in April, May and June.

676. The Grey-winged Ousel—*Merula boulboul.*

An occasional straggler to Lahore in the cold weather where I have seen it once in March. I have also seen it in March at Jullundur and in January at Wazirabad.

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677. The Black-throated Ousel—*Merula atrigularis.*
I have only seen this bird at Lahore in March when it passes through in fair numbers on migration.

720. The Baya—*Ploceus baya.*
Common resident, breeding June to September.

734. The White-throated Munia—*Uroloncha malabarica.*
Common resident. Found nests in April, May and July.

737. The Green Munia—*Stictospiza formosa.*
I have sent a separate account to the Journal of the breeding of this bird at Lahore. I have only noticed it at Lahore in August, breeding in evergreens in the Lawrence Gardens.

738. The Indian Red Munia—*Sporæginthus amandava.*
Fairly common resident at Lahore. I have not found its nest but have noticed fully fledged young ones at Xmas time. I have looked for its nest in the rains without success.

761. The common Rose-Finch—*Carpodacus erythrinus.*
This bird passes through Lahore in considerable numbers on migration in April, which is the only month in which I have observed it.

769. The Eastern Linnet—*Acanthis fringillirostris.*
At Lahore last September (1914) I saw several small parties of Linnets feeding in the grass rakh and passing overhead in a South-Easterly direction, which I fancy must have belonged to this species. I did not however shoot one.

775. The Yellow-throated Sparrow—*Gymnorhis flavicollis.*
My observations confirm Mr. Dewar's that this bird is only a hot weather visitor to Lahore. It arrives towards the end of March and leaves again in October. I have found nests in April, May and June.

776. The House Sparrow—*Passer domesticus.*
A very common resident. I have found nests in May and June and it undoubtedly breeds in other months as well, but I have not troubled to look for nests.

777. The Rufous-backed Sparrow.—*Passer pyrrhonotus.*
I have already sent an account to the Journal of the breeding of this sparrow at Lahore which is considerably outside its hitherto recorded range in the Fauna. It breeds usually in colonies in Kukur trees close to water. I have found nests at Lahore in May, June and August and at Wazirabad in April in the above situation, the only exceptions to which were two nests, one built in a creeper forming an ornamental archway in a garden, and the other in a hole in an iron gate at a level crossing, which the year before had been tenanted by a pair of yellow-throated sparrows, but in both cases the nests were in the vicinity of water. Other places I have met with this bird are Dera Ismail Khan, Multan, Gurdaspur and Ferozepore, so it would appear to be pretty generally distributed over the Punjab, though not occurring north of Wazirabad. It would appear to be a Resident at Lahore and can best be distinguished while at large from P. domesticus by its smaller size and very short throat stripe which does not extend down on to the breast as in P. domesticus.

778. The Spanish Sparrow—*Passer hispaniolensis.*
I have seen large flocks of this sparrow at Muridke in March on migration.

794. The Eastern Meadow Bunting—*Emberiza stracheyi.*
Passes through Lahore in considerable numbers in September and March and possibly some remain throughout the cold weather. Most numerous in March.

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795. The Grey necked Bunting—*Emberiza buchanani.*

I once came across a small party of what I took to be this species feeding on the ground at Lahore on 3rd May. Though I did not shoot one I managed to get quite close enough to observe them through glasses and particularly noticed a ring of greyish white feathers round the eye.

800. The Red-headed Bunting—*Emberiza luteola.*

This bird passes through Lahore in considerable numbers in April. I have also seen it at Peshawar in May.

808. The Indian Sand-Martin—*Cotile sinensis.*

Breeds at Lahore in March and appears to be a resident.

813. The Swallow—*Hirundo rustica.*

I attribute to this species the birds seen once at Atari in November and once at Lahore in January, though as pointed out in the Fauna the vast majority of the birds found in India appear to be intermediate between this species and *H. gutturalis* (The Eastern Swallow) and I have certainly seen birds breeding at Peshawar and Malikpur (Gurdaspur District) which looked intermediate between the two species though I have not shot them for the reason that they were breeding.

818. The Wire-tailed Swallow—*Hirundo smithii.*

This bird breeds at Lahore chiefly in May and June and during the cold weather its numbers are very considerably reduced if it does not entirely leave Lahore then.

822. Sykes Striated Swallow—*Hirundo nepalensis.*

Another breeding species which becomes rare in the cold weather. I have found nests in May, June and July.

826. The White Wagtail—*Motacilla alba.*

A cold weather migrant to Lahore arriving in September and leaving in April and fairly numerous.

829. The Masked Wagtail—*Motacilla personata.*

Another common cold weather migrant to Lahore, arriving and departing about the same time as the former species. Most conspicuous on the spring migration when it is in full breeding plumage.

831. The large Pied Wagtail—*Motacilla maderaspatensis.*

A common resident at Lahore, breeding chiefly in May and June, but also in April. A nest found at Lahore, was in a ferry boat, which made continual trips across the river.

832. The Grey Wagtail—*Motacilla melanope.*

I have seen what I am pretty certain was this bird at Lahore in September and it is probably a cold weather migrant.

835. The Indian blue-headed Wagtail—*Motacilla beema.*

A cold weather migrant to Lahore, arriving in September and leaving at the end of April or beginning of May.

837. The Yellow-headed Wagtail—*Motacilla citreola.*

A cold weather migrant to Lahore, arriving in September, and though I have no record of it on the spring migration, I have seen it at Jhelum in April, when I have no doubt it will also be found at Lahore.

841. The Indian Tree Pipit—*Anthus maculatus.*

I have noticed a Tree Pipit at Lahore in April and seen a large number at Campbellpore in May which I attributed to this species, but as I did not on either occasion shoot a specimen I cannot say for certain whether it was this species or A. trivialis.

844. The Brown Rock Pipit—*Anthus similis.*

I have shot this bird at Lahore in September and presume it is a cold weather resident. I have taken its eggs at Abottabad in May.

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847. The Indian Pipit—*Anthus rufulus.*

I have heard this bird in full song at Lahore in May and think it is resident, but so far as my observation goes it is scarce and I have never found its nest at Lahore though I have found several nests in the grass rakhs at Jhelum and Peshawar.

861. The Indian Sky-Lark—*Alauda gulgula.*

I have seen large flocks of Sky-larks at Muridke in March, which were either this lark or A. arvensis. It does not breed at Lahore, but further north at Wazirabad, Jhelum and Peshawar.

867. The Indian Sand Lark—*Alaudula adamsi.*

I have come across numbers of this lark on the banks of the Ravi at Lahore during the cold weather, and have found its nest at Wazirabad but not at Lahore, where I cannot be certain whether it is resident or not.

869. The Singing Bush-Lark—*Mirafra cantillans.*

I have found this birds' nest at Lahore towards the end of July on one occasion, but the nest was washed out by heavy rain before it was laid in. I cannot say whether it is resident and it appears to be scarce.

874. The Crested Lark—*Galerita cristata.*

This is the common lark of Lahore and a resident. I have found nests in March, April and May.

879. The Ashy-crowned Winch-Lark—*Pyrrhulauda grisea.*

A fairly common resident at Lahore where I have found its nest in April and May.

895. The Purple Sun-bird—*Arachnechthra asiatica.*

Here again I can confirm Mr. Dewar's statement that this bird is only a hot weather migrant to Lahore, arriving according to my observations in March and leaving in September. I have only records of nests in May, but it undoubtedly breeds in other months as well. I have observed it at Delhi in February and come across large numbers of young birds at Malikpur (Gurdaspur Dist.) in August. Can it be that the young birds retire from Lahore as soon as they are able to fly well, as I never remember having seen any there ?

972. The Yellow-fronted Pied Woodpecker—*Liopicus mahrattensis.*

Resident at Lahore where it breeds from the end of March to the beginning of May. I once witnessed an amusing attempt on the part of a pair of Yellow-throated sparrows to eject a pair of this species from their nest hole which apparently contained eggs. The victory ultimately lay with the woodpeckers, the cock bird of which showed himself no mean antagonist, and frequently closed with one or other of his adversaries, when the two would go whirling down together not separating till they reached the ground. After a couple of days of this warfare the sparrows gave it up as a bad job.

986. The Golden-backed Woodpecker—*Brachypternus aurantius.*

A common resident at Lahore, breeding in March, April and May. I once found a nest of this species at Lahore in a natural hollow of a tree not excavated by the birds.

1003. The Common Wryneck—*Iynx torquilla.*

I have seen this bird at Lahore in September and April when it apparently passes through on migration. Its call may sometimes be heard in the former month.

The Crimson-breasted Barbet—*Xantholæma hæmatocephala.*

A common permanent resident at Lahore, breeding in March and April.

1022. The Indian Roller—*Coracias indica.*

One of the commonest birds of Lahore and Resident. Breeds chiefly in May and June.

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1024. The European Roller—*Coracias garrula.*

This bird arrives at Lahore on migration in September, when I have shot it. I have not observed it at other times and do not know whether it occurs on the spring migration or is a winter resident.

1026. The Common Indian Bee-eater—*Merops viridis.*

In this case again I can confirm Mr. Dewar's observation that this bird is only a hot weather visitor to Lahore though I have come across stragglers at different times during the cold weather. For instance in two different years, *viz.*, 1909 and 1910. I came across several in the. Lawrence Gardens in January where they only remained a few days before disappearing again. I have seen several birds at Lahore on 24th October 1909 which is some time after their usual final disappearance and again on 24th February 1910, though they did not arrive in their usual numbers that year till 3rd March. Finally I saw a solitary individual at Atari on 21st November 1909, which is the only occasion in the cold weather when I have met this species entirely solitary, on other occasions it was in parties of six to a dozen individuals. It breeds at Lahore in April and May.

1027. The Blue-tailed Bee-eater—*Merops philippinus.*

As Mr. Dewar has pointed out this species is another which is only a hot weather migrant to Lahore, where I have not observed it after the first week of October or before the last week of April. I have taken hard set eggs on the 14th June and found well pledged young in a nest on the 3rd of the same month, so it must also breed in May.

1033. The Indian Pied Kingfisher—*Ceryle varia.*

A fairly common resident at Lahore. I have found its nest with eggs in March.

1035. The Common Kingfisher—*Alcedo ispida.*

Breeds at Lahore and is I believe resident, but is rather scarce. I once found a nest in the course of construction at Lahore on 28th March but it was deserted by the birds owing to my having disturbed them.

1044. The White-breasted Kingfisher—*Halcyon smyrnensis.*

Common resident at Lahore. Breeds in April and May.

1062. The Common Grey Hornbill—*Lophoceres birostris.*

The Fauna states that this bird is wanting in the Punjab, but I have found it fairly common at Lahore, more especially in the hot weather where I have found its nest on two occasions in the Lawrence Gardens in May and have seen young ones following their parents about later on in the hot weather.

In the case of one of the nests the Hornbills had taken forcible possession of a hole which a few days before had been occupied by a pair of Roseringed Paroquets who vigorously protested against such desecration of their rights but had to yield to the inevitable. When later on I opened the hole I found the hen bird sitting on three eggs but no trace of the former occupants.

1067. The Indian Hoopoo—*Upupa indica.*

One of the common birds of Lahore and a resident. Breeds chiefly in March though I have found young in May.

1073. The Common Indian Swift—*Cypcelus affinis.*

I think this bird is more or less a hot weather migrant to Lahore, only putting in an appearance for a few days at a time there during the cold weather and being altogether absent during December and January. It becomes common again in March and I have found young in April and eggs in August.

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1089. Syke's Nightjar—*Caprimulgus mahrattensis.*

I have shot this bird once at Lahore at the end of October while out shooting black partridge. I have never met with it since and do not think it breeds there.

1104. The Cuckoo—*Cuculus canorus.*

I have seen and heard this bird at Lahore in July and shot it in September. I have also seen it at Gujranwala (30 miles from Lahore) in April, so it probably passes through Lahore on both migrations.

1117. The Drongo Cuckoo—*Surniculus lugubris.*

I have already sent to the Journal an account of the occurrence of what I think was this Cuckoo at Lahore in October, which is the only occasion on which I have met with it.

1118. The Pied Crested Cuckoo—*Coccystes jacobinus.*

As Mr. Dewar has observed this species is only a hot weather migrant to Lahore, where I have observed it from June to September, a few and those only young birds being found in October. I have found its egg at Lahore in the Common Babbler's nest and have seen both this species and the Jungle Babbler feeding young Cuckoos.

1120. The Indian Koel—*Eudynamis honorata.*

Another species which Mr. Dewar has pointed out is only a hot weather migrant to Lahore. It arrives early in April and leaves towards the end of September and is very common at Lahore.

1130. The Common Coucal—*Centropus sinensis.*

A resident at Lahore and fairly plentiful. I have found its nest in May, July and August.

1135. The Large Indian Paroquet—*Palæornis nepalensis.*

A common resident at Lahore breeding in February and March.

1138. The Rose-ringed Paroquet—*Palæonis torquatus.*

A very common resident at Lahore breeding a trifle later than the preceding species, at least I have never found eggs before March.

1139. The Western Blossom-headed Paroquet—*Palæornis cyanocephalus.*

So far as Lahore is concerned this is only a cold weather visitor, arriving at the end of August or beginning of September and leaving early in March and being rarely met with except in the months mentioned when it is on migration. I have found it numerous in the hot weather in the Kangra valley where it breeds and have also seen large flocks containing young birds at Malikpur close to Pathankote at the end of July, while it breeds at Karna in February. As they pass through Lahore as late as March I fancy the birds seen there are the Kangra birds which probably spending the winter in such well wooded tracts as the Changa Manga forests, 40 miles to the south of Lahore.

1152. The Barn Owl—*Strix flammea.*

A resident at Lahore but only found in certain suitable localities. There is a certain mango tope on the banks of the Ravi close to Lahore where this bird is very numerous and where I have found several nests containing young in the months of July, October and November, though it only breeds as late as the latter two months when there has been a prolonged monsoon. I have looked for nests in vain in April and do not think that it commences to breed at Lahore before May or June.

1156. The Long-eared Owl—*Asio otus.*

I have only once come across a pair of these owls at Lahore in December and should say that it is a rare cold weather visitor.

1157. The Short-eared Owl—*Asio accipitrinus.*

This owl is met with in fair numbers at Lahore in October, towards the end of the month and thereafter may occasionally be seen till the end of February.

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1161. The Mottled Wood-Owl—*Syrnium ocellatum.*

A resident species at Lahore where I have found its nest with eggs in March.

A friend also took eggs at Atari in the same month. It is however not nearly as common as *B. coromandus.* For several years past a pair have taken up their abode in Government House grounds.

1169. The Dusky Horned Owl—*Bubo coromandus.*

This Owl is fairly common at Lahore, where I have records of six nests found, in December and January. Only those found in December contained eggs. Its call is often heard in the cold weather.

1178. The Collared Scops Owl—*Scops bakkamœna.*

Breeds at Lahore where I have twice found its nest in March and where it is I think resident.

I have never heard this bird's call that I know of and it must I think be remarkably silent.

1180. The Spotted Owlet—*Athene brama.*

A common resident at Lahore, breeding in March, which is the only month I have found eggs.

1191. The Black Vulture—*Otogyps calvus.*

By no means uncommon at Lahore, where I have found three nests in March, April and May, only that found in March contained an egg.

1192. The Griffon Vulture—*Gyps fulvus.*

I have frequently seen this bird during the cold weather at Lahore, though I have never succeeded in finding a nest. A friend of mine, however, told me that he found the nest (with an egg) on a tree in March.

1196. The Indian white-backed Vulture—*Pseudogyps bengalensis.*

Very common at Lahore where it commences to breed in October, most nests having young in January.

1197. The smaller white Scavenger Vulture—*Neophron ginginianus.*

Very common at Lahore, where it commences to breed in March. Nests found in May usually contain young.

1202. The Steppe Eagle—*Aquila bifasciata.*

I have seen this bird on various occasions during the cold weather at Lahore, the only recorded date being in January.

1203. The Indian Tawny Eagle—*Aquila vindhiana.*

A common resident at Lahore, commencing to breed at the end of October and in November. December is, I think, the best month in which to procure eggs and the majority of nests will be found to contain young in January. I once saw a pair of these eagles attack a white stork on the wing. One of the eagles pounced on the back of the stork while it was high up in the air, and brought it to the ground. On the ground the stork was quite a match for one eagle and kept its bill presented to the enemy.

The eagle's mate, however, now joined in and took up a position on the ground immediately behind the stork and as soon as the first eagle drew the stork's attention by a frontal attack, the second sailed in and caught the stork by the neck from behind, bearing the stork's head to the ground by sheer weight.

The stork still kept its feet however and flapped its wings violently, but by the time I arrived on the scene, breathless, both its eyes had been gouged out, though it seemed otherwise to be unhurt and could still stand. Needless to say I put the poor bird out of its misery.

1207. Bonelli's Eagle—*Hieraëtus faciatus.*

This bird breeds at Lahore where I have found its nest with eggs, in January situated in a large mango tree in a tope.

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The ground under the tree was littered with fowl's feathers and pellets containing squirrel's skulls. Though I have visited the nest every year since I have not again found eggs, though the birds were always in the vicinity and the nest was sometimes lined with green leaves. When I last visited the spot on 25th December 1914, I saw the birds pairing and observed a half built nest on a tree close to that containing the old nest, which on this occasion had been occupied by a pair of white backed vultures. The new nest I was subsquently told was blown down.

1216. The short-toed Eagle—*Circaëtus gallicus.*

I have seen this eagle at Muridke in January but cannot say whether it breeds round Lahore.

1217. The Crested Serpent-Eagle—*Spilornis cheela.*

I have seen what I think was this species at Lahore in the cold weather. I did not shoot the bird but the well marked light bars on the wing make me think it was this species.

1220. The White-eyed Buzzard-Eagle—*Butastur teesa.*

Common resident at Lahore, though somewhat scarce in the cold weather. It breeds in April.

1223. Pallas's Fishing Eagle—*Haliaëtus leucoryphus.*

Breeds at Lahore and is I think resident. I have taken eggs at the end of October, and only know of the one pair that breed anywhere near Lahore.

1228. The Brahminy Kite—*Haliastur iudus.*

I have observed this bird in the cold weather at Lahore in October and March, but I have not observed it at other times and do not think that it breeds in the vicinity.

1229. The Common Pariah Kite—*Milvus govinda.*

Very common at Lahore where it is resident and breeds from January to March, chiefly in the latter month.

1232. The Black-winged Kite—*Elanus cœruleus.*

I have seen this bird in the cold weather at Lahore and in March and July so it may breed there. I have found it breeding at Peshawar in May.

1236. The Pied Harrier—*Circus melanoleucus.*

I have seen at Lahore on several occasions in October what on the wing looked like a black Harrier with a conspicuous white rump which I took to be this species, but as I did not shoot the bird I cannot be certain. There is at least one other species of the genus circus which occurs round Lahore in the cold weather, but as I did not shoot the birds and the members of this Genus are to much alike I cannot venture to predict to which species they are assignable.

1239. The Long-legged Buzzard—*Butes ferox.*

This bird may be met with at Lahore in the cold weather from September onwards.

1244. The Shikra—*Astur badius.*

A common resident at Lahore, breeding chiefly in April but also in May.

1247. The Sparrow-Hawk—*Accipiter nisus.*

At Atari in February I have seen a hawk which looked very like this species, and which my hawker who seldom made a mistake affirmed to be so.

1249. The Crested Honey-Buzzard—*Pernis cristatus.*

This bird at Lahore is I think a hot weather visitor only arriving in April and leaving in October, and seldom if ever being seen during the cold weather. I have only found nests with eggs in May. The

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call of this bird in the breeding season is a prolonged continuous grasshopper-like note sustained for a couple of minutes at a time, while the bird sits with elevated crested and head moving from side to side as if scanning the neighbourhood for its mate.

1254. The Peregrine Falcon—*Falco peregrinus.*

A fairly common cold weather visitor to the neighbourhood of Lahore, arriving in October and leaving early in April. I have often observed it while out hawking, when it has been attracted either by the lure or by the sight of my trained peregrines.

1255. The Shahin Falcon—*Falco peregrinator.*

I have frequently seen this bird at Lahore and in the neighbourhood during the cold weather. I have during several years noticed an old bird hunting the Lawrence Gardens for several weeks in March, much to the alarm of the parrots.

1257. The Luggar Falcon—*Falco jugger.*

A fairly common resident at Lahore, where it breeds commonly in February and March, though I once found young as late as June.

1258. The Cherrug Falcon—*Falco cherrug.*

Out hawking once in the cold weather near Lahore, my hawker pointed out to me a wild bird of this species, which I was unable to identify myself as I have never kept and trained this species.

1264. The Red-headed Merlin—*Æsalon chicquera.*

A common resident at Lahore, where I have only found in eggs in March. A nest of unusually coloured eggs I found contained two eggs which had a whitish ground colour and for markings only some large underlying spots of violet round the larger end (I write from memory).

1265. The Kestrel—*Tinnunculus alaudarius.*

This is I think the bird which is to be seen occasionally round Lahore in the cold weather from September onwards. I admit a slight doubt in the matter as I have not shot the bird and so it might just possibly prove to be *T. cenchris* (The Lesser Kestrel).

1272. The Southern Green Pigeon—*Crocopus chlorogaster.*

This is the Green Pigeon found at Lahore, which breeds in the rains and keeps in large flocks at other times. A friend of mine tells me that he found the nest in April, but this does not coincide with my experience as the only nest I have so far found was discovered on the 1st July and I have found the birds still in flocks at the end of May and not in pairs till the end of June.

1292. The Indian Blue Rock-Pigeon—*Columba intermedia.*

Resident in large numbers in the city of Lahore. It goes out every morning early in large flocks to feed in the fields. These flocks follow recognised 'lines' or routes and very good shooting can be had in the autumn by taking one's stand on one of these routes and waiting for the returning birds, most of which time to get home before the sun is well up. The European species, *C. livia*, is very probably also found at Lahore, but I have not taken the trouble to verify the fact.

1295. The Eastern Stock-Pigeon—*Columba eversmanni.*

This is a cold weather visitor to the neighbourhood of Lahore and I have shot individuals out of large flocks at Atari in November and seen the species at other times during the cold weather.

1307. The Spotted Dove—*Turtur suratensis.*

So far as I can ascertain this bird is only a migrant to Lahore, passing through in July, August and September, and again in April, and not being met with at other times.

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1309. The Little Brown-Dove—*Turtur cambayensis.*

A very common resident at Lahore, breeding throughout the hot weather and up to October.

1310. The Indian Ring-Dove—*Turtur risorus.*

A very common resident. I have found nests with eggs throughout the hot weather from March to October inclusive.

1311. The Red Turtle-Dove—*Œnopopelia tranquebarica.*

Mr. Dewar has already drawn attention to the fact that this bird is only a hot weather visitor to Lahore. It arrives early in April and commences to breed at once, containing to do so throughout the hot weather till it leaves in September, which is the ordinary month of departure, though if the monsoon be protracted it does not leave till later and I have found a nest as late as 27th September. I once found three eggs in a nest of this species.

1316. The Black-bellied Sand-Grouse—*Pterocles arenarius.*

Large flocks of this bird are to be seen on the plains of Muridke throughout the cold weather from October to March and it is the commonest Sand-Grouse round Lahore.

1321. The Common Sand-Grouse—*Pteroclurus exustus.*

I once came across a large flock of Sand-Grouse with the underparts including the wing lining very dark brown, which I think was this species though, I did not manage to shoot one. This was at Lahore in October and I have also come across two pairs of the same bird once in April, so it may breed close to Lahore probably at Maridke.

1355. The Grey-Quail—*Coturnix communis.*

These birds arrive at Lahore early in September and some times at the end of August (though I have not personally shot them earlier than the 8th September) and leave again in April. I have heard cases of their breeding at Lahore—but have not myself found a nest.

1356. The Black-breasted Quail—*Coturnix coromandelica.*

I have been shown specimens of this bird captured at Lahore during the monsoon, which appears to be the only time it is found there. It is, I think, scarce on the whole.

1372. The Black Partridge—*Francolinus vulgaris.*

This bird is a resident at Lahore and common in certain localities. I have had eggs brought me in June though I have never found a nest.

1375. The Grey Partridge—*Francolinus pondicerianus.*

A common resident at Lahore. I have found a nest with eggs in April and seen young in May.

1383. The Little Button-Quail—*Turnix dussumieri.*

I have been shown a button-quail caught at Lahore, in September, which I believe was this species.

1407. The Common Crane—*Grus communis.*

I have seen this bird at different times during the cold weather round Lahore, and have observed it high in the air on migration in March.

1415. The Houbara—*Houbara macqueeni.*

I have met with this bird not far from Lahore in February, but it is not common in the vicinity.

1437. The Sociable Lapwing—*Chettusia gregaria.*

This bird may occasionally be seen for a few days at the end of the cold weather at Lahore, when it is evidently on migration. I have no record of the exact date of its appearance at Lahore though I have seen it at Fullun dur in March.

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1431. The Red-wattled Lapwing—*Sarcogrammus indicus.*

A common breeding species at Lahore and resident. Breeds April to June, chiefly in May.

1436. The Lapwing—*Vanellus vulgaris.*

This bird is common at Atari in the neighbourhood of jhils in the cold weather.

1438. The White-tailed Lapwing—*Chettusia leucura.*

I have seen this bird at Atari in November and at Lahore in March though it is not common.

1451. The Black-winged Stilt—*Himantopus candidus.*

I have only seen this bird twice at Lahore, once on 2nd May and the second time on 20th June in flooded fields, each time in small flocks. So far as I know it does not breed near Lahore.

1454. The Curlew—*Numenius arquata.*

I have once come across a solitary individual at Atari in November, which is the only time I have met with the species.

1456. The Black-tailed Godwit—*Limosa belgica.*

I have met with flocks of what I am almost certain was this wader on the edges of jhils at Atari in the cold weather.

1462. The Green Sandpiper—*Totanus ochropus.*

Common at Lahore throughout the cold weather and till the middle of May. At least one other species of Sandpiper is found at Lahore, but as I have not shot the birds I am doubtful of their identity.

1465. The Spotted Redshank—*Totanus fuscus.*

This is I think the bird I have seen at Atari feeding in a pond by a village, but as I did not shoot it it may possibly have been *T. calidris*, the Redshank.

1466. the Greenshank—*Totanus glottis.*

This bird is a cold weather migrant to Lahore arriving in September.

1484. The Common Snipe—*Gallinago cœlestis.*

A common cold weather visitor to the neighbourhood of Lahore. I have shot this bird at Atari on 4th September and at Muridke on 13th March. I have seen it at Jhelum as late as the 18th April.

1487. The Jack Snipe—*Gallinago gallinula.*

I have shot this snipe round Lahore during the cold weather but have not recorded the date.

1504. The Black-bellied Tern—*Sterna melanogaster.*

Breeds on the Ravi at Lahore in March. During the middle of the day the birds do not appear to sit but only stand over their eggs to protect them from the sun, and the eggs I found at Lahore were besprinkled all over with water, apparently as an additional precaution on the part of the birds to prevent them from becoming overheated.

1542. The Black Ibis—*Inocotis papillosus.*

Large flocks of this Ibis may be seen during the cold weather at Atari where I have often hawked it. I know nothing regarding its breeding.

1545. The Spoonbill—*Platalea leucorodia.*

I have captured this bird when out hawking at Atari in the cold weather, but it is not common and I know nothing about its breeding.

1546. The White Stork—*Ciconia alba.*

This bird is a common cold weather migrant to Lahore and the neighbourhood, arriving early in September and leaving in March.

1548. The White-necked Stork—*Dissura episcopus.*

I have seen this Stork at Lahore in September and on one or two other unrecorded dates in the cold weather.

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1547. The Black Stork—*Ciconia nigra.*

I have seen this bird at Atari in November but otherwise do not remember having come across it.

1555. The Common Heron—*Ardea cinerea.*

A common cold weather visitor to Lahore where I have never observed it during the hot weather.

1561. The Little Egret—*Herodias garzetta.*

I have seen what I took to be this species at Lahore in June and October.

1565. The Pond Heron—*Ardeola grayi.*

A common resident. I have found nests in May, July and August at Lahore.

1568. The Night Heron—*Nycticorax griseus.*

Mr. Dewar has described this species as a hot weather visitor to Lahore, and I am certainly inclined to agree with him, though I cannot be quite certain on the point, as I have come across a large colony with young as late as October 30th at Lahore. During this particular year (1910) there was a very late monsoon and the usual birds had bred in the Zoo in April.

It is somewhat remarkable that though the birds visit their quarters in the Lahore Zoo almost without exception yearly in April to breed, they very occasionally fail to do so, the reason for which I am at a loss to explain, unless it be that in some years the duck pond (round which they breed) has not sufficient water in it.

In such years it may be the rather unpleasant odour arising from the pond which drives them away.

1583. The Barred-headed Goose—*Anser indicus.*

This bird is frequently to be seen on the jhils at Atari and Mukirde during the cold weather.

1588. The Ruddy Sheldrake—*Casarca rutila.*

Very common all round Lahore in the cold weather.

1592. The Mallard—*Anas boscas.*

Common in the neighbourhood of Lahore during the cold weather. I have heard of it being shot as early as September 19th and have shot it myself in February.

1593. The Spotted-billed Duck—*Anas pœcilorhyncha.*

Fairly common throughout the cold weather round Lahore.

1595. The Gadwall—*Chaulelasmus streperus.*

Very common round Lahore during the cold weather. I have shot this Duck as late as March 13th at Muridke.

1597. The Common Teal—*Nettium crecca.*

Very common around Lahore throughout the cold weather I have shot birds on the Ravi at Lahore on March 21st.

1599. The Wigeon—*Mareca penelope.*

Fairly common on the ghils round Lahore during the cold weather.

1600. The Pintail—*Dafila acuta.*

Another Duck fairly common round Lahore. The latest date I have shot birds is the 12th February.

1601. The Garganey Teal—*Querquedula circia.*

A common cold weather visitor to the neighbourhood. I have seen a flock of Teal, probably this species at Lahore on August 18th, and have shot birds on the Ravi on March 21st. Also seen at Gurdespur on August 9th.

1602. The Shoveller—*Spatula clypeata.*

Common cold weather visitor, the latest date I have shot birds being March 13th.

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1604. The Red-crested Pochard—*Netta rufina.*

Fairly common cold weather visitor. I have shot this bird at Atari in November and saw a flock on the Chenab at Wazirabad as late as April 4th.

1605. The Pochard—*Nyroca ferina.*

This is a common cold weather visitor. My boatman assured me that certain Duck seen on Kaisapur Jhil, Gurdaspur on August 9th belonged to this species.

1606. The White-eyed Duck—*Nyroca ferruginea.*

Another common cold weather visitor. This again was one of the species which according to the boatmen, we saw on Kaisapur Jhil, Gurdaspur on August 9th. I was on the Jhil early in the morning and several flights of Duck, which did not look to me to be Teal, arrived while I was there:

Unfortunately I had only a small collecting gun with me and so could not verify the boatmen's statement, though the latter, I would mention are expert Shikaris and during the cold weather do nothing but take parties of sportsmen out on the Jhil which is well known for its duck shooting.

1612. The Smew—*Mergus albellus.*

I have heard of this Duck being shot close to Lahore during the cold weather, but have only once come across it myself at Fazilka (Ferozepore district) in March.

I think it is decidedly scarce.

1617. The Indian Little Grebe—*Podicipes albipennis.*

This bird is often to be seen on the Jhils round Lahore and I have seen it during the monsoon on a tank close to the Railway Station where it very possibly breeds though I have not taken the trouble to verify the fact.

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NOTES ON COORG BUTTERFLIES WITH A DETAILED LIST OF THE HESPERIIDAE.

BY

F. HANNYNGTON, I.C.S., F.Z.S.

The little Province of Coorg harbours practically all the known species of Southern Indian butterflies with the exception of the Nilgiri palæarctic survivals, the Travancore *Parantirrhœa* and a few local races.

The climate is of the usual Western Ghâts type, an excessively hot moist belt running along the western foot of the Ghâts which rise rapidly to 4,000 and 5,000 feet. East of their summits, there is a fairly gradual fall towards Mysore, till the evergreen jungle of the upper basin of the Cauvery blends with the dry deciduous vegetation of the Mysore plateau.

While the commoner forms may be said to be on the wing all the year round, there is enough seasonal variation in temperature and humidity to restrict most of the rarer species to a dry and a wet season brood. This is however not always the case. In April the air, though not containing enough moisture to give rain at low levels, becomes saturated in rising over the Ghâts and produces a peculiar belt of thunderstorm rainfall along their eastern slopes.

This induces a good number of the rarer species to hatch out, so that May and October may be looked upon as the most likely months in which to find the characteristic forms of the wet season brood—or broods. During the intervening months the monsoon is usually too heavy to permit of much collecting in the evergreen belt.

The following are the totals of the various families and sub-families of which records are obtainable :—

Danainae	10
Satyrinae	20
Morphinae	2
Nymphalinae	44
Acraeinae	1
Libythaeinae	2
Nemeobidae	1
Papilionidae	18
Pieridae	29
Lycaenidae	78
Hesperiidae	61
Total ..	266

The ten species of Danainae found in Coorg offer nothing worthy of note except that *Eupl. kollari*, Feld., and *E. coreta*, God., are decidedly rarer here than in the Nilgiris.

Among the Satyrinae, *Zipœtis saitis*, Hew., occurs fairly commonly on all the western slopes during the monsoon and more rarely in January.

Ypthima chenui, Kir., and *Mycalesis adolphei*, Guér., would appear to reach their northern limit in Coorg. Both are extremely local and are only to be found on or near the summits of the highest range of Western Ghâts. *Y. chenui* I have only found on the summit of Swamibetta or Somamalai (5,265 feet). The locality 'Mangalore' given in Evans' list for *M. adolphei* is almost certainly wrong : it is exclusively a hill species and I only have it from Tadiandamol (5,724 feet) and Swamibetta.

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The '*Calysisme*' group of *Mycalesis* appear to fall under the following in Coorg:—

(i) *M. perseus*, Fab.
(ii) *M. mineus polydecta*, Cr.
(iii) *M. perseoides igilia*. Fruh. To be distinguished from *polydecta* by the sharply angled discal line on the forewing below.
(iv) *M. subdita*, Mre., with the ocellus on the upperside of the forewing surrounded by a narrow, sharply defined yellow ring.

Regarding *Myc. anaxias* Major Evans writes :—

" Coorg specimens differ from the Northern Indian form in a most im-
" portant particular, the patch of modified scales above the end of the cell
" upper hind wing is deep black while in the Northern Indian form it is grey.
" Your form is typical, so the Northern Indian form will have to be given a
" new name."

It is to be hoped that Major Evans' monograph on *Mycalesis* which has been interrupted by the war will clear up the many doubtful points connected with the Southern Indian *Mycaleses*. Moore's method of describing *Myc. subdita* from Southern India and then figuring a specimen from Ceylon is a trifle confusing.

Melanitis zitenius yokala is decidedly rare in Coorg.

Among the Nymphalinae, *Charaxes imna* is fairly common in the evergreen while *C. fabius* is a rare visitor on the east. I have found the females of *Apatura parisatis camiba* and *Euripus consimilis meridionalis* more common than the males—a decided reversal of Himalayan experience with the typical forms.

Of the five Euthalias, *E. landabilis, Swin.*, is not uncommon on the western slopes in January and September, while in August I have noticed it twice in deciduous forest on the eastern boundary, though never in the intervening country. This eastern form is decidedly paler and would no doubt be elevated into a race by Fruhstörfer. *E. nais*, Forster, is rare at Fraserpet in the east. *Vanessa indica nubicola*, Fruhstörfer, is a rarity in Coorg and possibly a straggler from the Nilgiris in the cold weather.

Atella alcippoides, M., like its larva, is decidedly local and gregarious, occurring only in the vicinity of its food plant *(Alsodeia zeylanica)* on the western slopes. Of *Eulepis schreiberi* and *Doleschallia malabarica*, I have only seen one specimen in three years—both on the Periambadi Ghât road. They may be counted as the least common of the Coorg Nymphalidae.

Among the 18 Papilionidae, *P. liomedon* is probably the least often captured. I have found it on the Periambadi Ghât in January, May, June and December, so that it is certainly double-brooded. It affects the flowers of *Mussaenda frondosa* but is always hard to catch.

P. antiphates in Coorg is identical with the Travancore form figured by Bingham as typical, but placed as race *naira*, M're., by Evans.

P. dravidarum I have only found at the foot of the western slopes and never abundant. Mr. T. N. Hearsey states that he found it common at Pollibetta on lantana flowers in August.

The 29 Pieridae offer nothing worthy of note. Five species of *Colotis* are to be found along the eastern border, while on the western slopes the following forms of Appias intermingle:—

Appias libythea, Fob.
,, *hippo latifasciata, M.*
,, *albina swinhoei, M.*
,, *wardi, M.*
,, *indra statilia, Fruh.*

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The two latter forms are the rarest and are most likely to be found along the foot of the Ghâts.

Thirty-seven species of Lycaeninae are recorded from Coorg. Among these *Nacaduba* is the dominant genus represented by :—

N. viola, N. macrophthalma, N. dana, N. nora, N. hampsoni, N. atrata and *N. plumbeomicans.*

Among the Theclinae, *Aphnæus* falls under:—*A. vulcanus*, Fab., *A. schistacea*, M., *A. abnormis*, M., *A. lohita*, Hors., and *A. ictis*, Hew.

Thaduka multicaudata, M., may be looked for on the western slopes below 2,000 feet in May, August and September. The tenacity of life of this species is remarkable and worthy of a *Parnassius.*

Amblypodia anita, Hew., is rare in the northern open country in June and November.

Zinaspa todara I have found at Fraserpet and Pollibetta in August.

Arhopala is represented by :—*A. centaurus pirama*, M., *A. amantes*, Hew. *A. bazaloides*, Hew., and *A. canaraica*. *A. abseus*, Hew., may occur, but I have no record of its capture.

Hesperiidæ.

206. *Celænorrhinus leucocera*, Kollar. Common from May to October on the western slopes.

207. *Celænorrhinus spilothyrus*, Felder. On the Ghâts during the monsoon. Rare in January.

208. *Celænorrhinus fusca*, Hampson. Not common on Periambadi Ghât in September.

209. *Coladenia tissa*, Moore. Pushpagiri May, Fraserpet and Tittimatti, July and August.

210. *Coladenia dan*, Fab. Annual.

211. *Odontoptilum angulata*, Felder. Eastern forests, May to September.

212. *Caprona ransonnettii*, Felder. May to October.

213. *Caprona syrichthus*, Felder. Eastern forests, May and August.

214. *Tagiades distans*, Moore. Annual.

215. *Tagiades atticus*, Fab. In the Bamboo (South Coorg) and Ghâts.

216. *Satarupa bhagava*, Moore. Eastern forests, May to October.

217. *Sarangesa purendra*, Moore. November to January.

218. *Sarangesa dasahara*, Moore. June to September.

219. *Hesperia galba*, Fab. Annual.

220. *Baracus hampsoni*, Elwes. Annual.

221. *Sancus pulligo*, Mab. Western slopes in the monsoon.

222. *Suastus gremius*, Fab. Annual.

223. *Suastus bipunctus*, Swin. Annual but not common.

224. *Taractrocera maevius*, Fab. A single specimen near Fraserpet in August.

225. *Ampittia maro*, Fab. Eastern forests, May to September.

226. *Iambrix salsala*, Moore. Annual.

227. *Aeromachus indistincta*, Moore. Annual.

228. *Pedestes sala*, Hewitson. Periambadi Ghât, October.

229. *Hyarotis adrastus*, Cramer. South Coorg and Ghâts in the monsoon.

230. *Arnetta vindhiana*, Moore. Annual.

231. *Gangara thyrsis*, Fab. South Coorg and Ghâts in the monsoon.

232. *Matapa aria*, Moore. Not common, but widely distributed.

233. *Notocrypta feisthamelii*, Boisd. Annual.

234. *Notocrypta restricta*, Moore. Sufficiently distinct from the foregoing. They fly together on the western slopes in September and October.

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235. *Notocrypta basiflava*, de Nicéville. I found this fairly common in in ember 1913 at mile 153 on the Periambadi Ghât on the white flowers strobilanthes barbatus. In September 1915 not one was to be found. As s strobilanth is reputed to flower only once in 7 years, passibly the tterfly will escape observation here till 1920.

236. *Udaspes folus*, Cramer. Annual.

237. *Telicota augias*, Linn. Annual.

238. *Telicota bambusæ*, Moore. Annual.

239. *Telicota concinna*, Elwes. I have only come across this on the western slopes in the monsoon.

240. *Telicota gola*, Moore. Annual.

241. *Telicota dara*, Kollar. Annual.

242. *Halpe astigmata*, Swin. Western Ghâts in the monsoon.

243. *Halpe moorei*. Watson. Annual.

244. *Halpe ceylonica*, Moore. Western Ghâts.

245. *Halpe hyrtacus*, de N. Western Ghâts.

246. *Halpe honorei*, de N. Western Ghâts. I am not quite certain that I have identified the last 3 species correctly. They seem to fly together in January and during the rains, but none can be described as common.

247. *Halpe sitala*, de N. Nagarholé, Eastern forests in May; one specimen.

248. *Parnara plebeia*, de N. Annnal.

249. *Parnara prominens*, Moore. Western slopes, August.

250. *Parnara mathias*, Fab. Annual.

251. *Parnara kumara*, Moore. Annual.

252. *Parnara canaraica*, Moore. Western slopes, May, August.

253. *Parnara toona*, Moore. Annual.

254. *Parnara bada*, Moore. Annual.

255. *Parnara colaca*, Moore. Annual.

256. *Parnara bevani*, Moore. Annual.

257. *Parnara conjuncta*, Hs. Western slopes, August.

258. *Ismene fergusonii*, de N. Fairly common in the evergreen belt, especially in the monsoon.

259. *Ismene gomata*, Moore. I have only seen 2 specimens, both taken on the Ghâts in August.

260. *Rhopalocampta benjamini*, Guérin. Northern forests in June and September.

261. *Badamia exclamationis*, Fab. Annual, but not common.

262. *Bibasis sena*, Moore. Eastern forests. Annual.

263. *Hasora chabrona*, Plotz. Bhagamandala, January.

264. *Hasora chromus*, Cramer. Annual.

265. *Hasora badra*, Moore. Not common.

266. *Tapena hampsoni*. One male on 8th May 1916 at Srimangala South Coorg.

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SOME BIRDS OBSERVED AT DALHOUSIE HILL STATION IN 1915.

By H. Whistler, M.B.O.U.

During the Summer of 1915 I was stationed in the Gujranwala District of the Punjab, and managed to get away from there twice for a fortnight on each occasion, to the hill station of Dalhousie, situated in Chamba State, which is reached by a tonga-journey of some 50 odd miles from Pathankot station.

As my spare time on both of these trips was largely spent in collecting birds, it may be of interest to set on record a few notes regarding the birds seen or obtained in Dalhousie and along the tonga-road. As far as I know there is no article or list in any Ornithological publication dealing separately with the birds of this hill station, so these notes may be of use to any future observer who desires to supply the omission.

For the first trip I went up on 28th May and came down on the 13th June; on the second occasion I went up on 28th August and returned on the 12th September. For the sake of convenience these two periods are spoken of hereafter as June and September respectively.

Apart from the journeys along the tonga-road, practically all observations were made on Bakrota Hill at an elevation of about 7,300 feet.

The mixed hunting parties of small insectivorous birds, which have been so often commented on by Naturalists in the Himalayas, were one of the chief features of Dalhousie bird life; but they were, I think, more commonly observed on the second trip.

The nomenclature is taken from the four volumes of "Birds" by Blanford and Oates in the "Fauna of British India" series; the numbers prefixed to the names of each species are the serial numbers of that work.

4. The Jungle Crow—*Corvus macrorhynchus*, Wagl.

Equally common in Dalhousie both in June and September, and often to be seen in parties circling high above the summits of the hills. In June the species was noted all along the tonga-road down to Pathankote.

13. The Yellow-billed Blue Magpie—*Urocissa flavirostris*, Blyth.

Fairly common on Bakrota, both in June and September.

16. The Indian Tree-pie—*Dendrocitta rufa*, Scop.

Not noted in Dalhousie, but seen on the tonga-road below Dunera in September.

24. The Black-throated Jay—*Garrulus lanceolatus*, Vig.

Very common on Bakrota both in June and September, being often met with in family parties; not a shy bird.

26. The Himalayan Jay—*Garrulus bispecularis*, Vig.

Met with on Bakrota in small numbers, but certainly less numerous than the last species.

27. The Himalayan Nutcracker—*Nucifraga hemispila*, Vig.

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A Nutcracker, attributed to this species, was seen on the Upper Bakrota in on 2nd September.

1. The Indian Grey Tit—*Parus atriceps*, Horsf.

This familiar Tit was not actually noted except on the tonga-road some y below Dalhousie in June. It does not appear to occur as high as pper Bakrota Mall (7,300 ft.). This is curious considering that it is common at 7,000 ft. in the ranges further west about Murree.

34. The Green-backed Tit—*Parus monticola*, Vig.

This is the common Tit of Bakrota where it was found both in June and September. It was met with alone, in pairs, and in company with hunting parties of other small insectivorous birds.

35. The Red-headed Tit—*Ægithaliscus erythrocephalus* (Vig.).

Met with both in June and September in large flocks which were usually hunting in company with other small insectivorous birds.

42. The Yellow-cheeked Tit.—*Machlolophus xanthogenys* (Vig.).

A party of these Tits was met with on 9th September on the Upper Bakrota Mall (7,300 feet).

44. The Crested Black Tit—*Lophophanes melanolophus* (Vig.).

A few individuals were met with in September; all were found with hunting parties of other birds.

91. The Western Variegated Laughing-Thrush—*Trochalopterum simile*, Hume.

Two immature birds were shot from a party of this species in heavy undergrowth in the catchment area (7,300 feet) on Bakrota on 10th September.

99. The Himalayan Streaked Laughing-Thrush—*Trochalopterum lineatum* (Vig.).

Common, both in June and September, and always an inveterate skulker in the undergrowth. A nest found with 3 fresh eggs on 8th June was built about 2 feet from the ground in a small bush on an open bush studded slope near the house. It was made of dry grasses and leaves, mixed with a few fine twigs. The hollow was deep and neatly lined with fine roots. When first observed about mid-day the sitting bird was apparently asleep. Both sexes appear to share the work of incubation. The three eggs measure 25×19; $25{\cdot}5 \times 19{\cdot}5$; $25{\cdot}5 \times 19$ mm.

105. The Common Babbler—*Argya caudata* (Dum.).

Common along the lower portion of the tonga-road, and observed as high as Sukret stage on 28th August.

110. The Jungle Babbler—*Crateropus canorus* (L.).

Common along the lower portion of the tonga-road; met with as high as Bauli stage on 28th August.

204. The Black-headed Sibia—*Lioptila capistrata* (Vig.).

Not uncommon and met with both in June and September on Bakrota. It is an arboreal species and usually goes about in pairs. The call notes are very loud and clear.

226. The Indian White-eye—*Zosterops palpebrosa* (Temm.).

Common in the foot-hills along the tonga-road in May.

269. The Himalayan Black Bulbul—*Hypsipetes psaroides*, Vig.

Met with on one or two occasions both in June and September but apparently not so common as at similar elevations in the Murree Hills.

327. The Indian Black Drongo—*Dicrurus ater* (Herm.).

Common on Bakrota, both in June and September.

341. The Himalayan Tree-creeper—*Certhia himalayana*, Vig.

Fairly common in September but not noted in June. Usually met with in the hunting parties of small birds.

416. Brooks' Willow-Warbler—*Phylloscopus subviridis* (Brooks).

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Very common in September, when its monotonous somewhat plaintive call was to be heard on all sides.

422. The Greenish Willow-Warbler—*Acanthopneuste viridanus* (Blyth).

A specimen was obtained on the 4th September.

429. Blyth's Crowned Willow-Warbler—*Acanthopneuste trochiloides* (Sundev.).

Appeared to be common in September, and often met with in company with hunting parties.

434. Hodgson's Grey-headed Flycatcher-Warbler—*Cryptolopha xanthoschista*, Hodgs.

Met with commonly both in June and September; this was one of the species of which several examples were to be expected in every hunting party; it hunts for insects both in the trees and in the undergowth. The call is loud and distinctive.

495. The Short-billed Minivet—*Pericrocotus brevirostris* (Vig.).

Common both in June and September; a very large flock was seen near the catchment area beyond Bakrota on 2nd September, and this contained but few red males.

518. The Indian Oriole—*Oriolus kundoo*, Sykes.

Common in the foot-hills along the tonga-road, in both June and September, but not noted higher than Dunera.

544. The Black-headed Mynah—*Temenuchus pagodarum* (Gm.).

Common in the foothills in June, and noted there also in September, when however it was perhaps less numerous. Not noted higher than Dunera.

549. The Common Mynah—*Acridotheres tristis* (L.).

This common plains bird was met with as high as Bakrota Mall (7,300 ft.) where a couple of pairs were nesting in the roof of our house in June; their young birds were still about the garden in September.

558. The Sooty Flycatcher—*Hemichelidon sibirica* (Gm.).

The Sooty Flycatcher was not observed in June, but in September it was one of the most noticeable birds at 7,300 feet on Bakrota, 4 or 5 individuals being often in sight at one and the same time on different trees. They frequented the tops of trees where they perched on the highest shoots and twigs, sallying forth incessantly on short flights after insects and returning each time to their original perch. The species was not in the least shy, and I found that in the case of some favourite perches if the occupier was shot a successor arrived in a few minutes to occupy his place. The majority seen were in the spotted immature plumage, and were probably on migration.

568. The White-browed Blue Flycatcher—*Cyornis superciliaris* (Jerd.).

Met with occasionally both in June and September. A nest with 4 fresh eggs was obtained on 6th June. This was well concealed in a shallow hole in the face of an ivy covered bank some 3 feet from the ground by a path, and was built of moss, with a deep cup lined with fine strips of fibre and bark and some fine grey hairs. The eggs measured 16·5×13; 16·5×13; 16×13; 16×12·5 mm. This Flycatcher captures its prey both from elevated perches, and amongst low undergrowth.

579. The Verditer Flycatcher—*Stoparola melanops* (Vig.).

Common, both in June and September on Bakrota. Four nests were found as follows :—

31st May—c/4 eggs, hard set, in a cup nest of moss lined with fine roots, built amongst earth and roots in the overhanging top of a broken bank face above a path.

31st May—c/3 fresh eggs (remains of a fourth egg in the nest) found in a nest similar in construction and situation to the above. The eggs measured respectively 18·5 × 14·5 ; 19 × 15 ; 19·5 ×15 mm.

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2nd June—A nest containing 3 naked young birds found built in a hollow in a kind of crag, formed by earth and stones gathered round the trunk and roots of a tree, which was growing in the middle of a watercourse below a road.

4th June—3 naked young and an addled egg found in a nest of the above type which was placed about 15 feet above a road under the scarpe of a high bank. The egg measured 20 × 14 mm.

This nest is always one of the easiest to find in the Western Himalayas owing to the frequent habit of the species of building in banks by paths, the site of the nest being further betrayed by the sitting bird which usually dashes out in front of any passer-by.

The Verditer Flycatcher is accustomed to hawk from bare twigs at the tops of trees.

589. The Rufous tailed Flycatcher—*Alseonax ruficaudus* (Swains.).

Not observed in June but met with commonly in September when individuals were often found in the hunting bands of small birds. This Flycatcher was not observed to hawk in the open, but was always found perching and darting about after insects within the boughs and foliage of trees.

Four specimens preserved are all in adult plumage.

592. The Grey-headed Flycatcher—*Culicicapa ceylonensis* (Swains.).

Only once noted in June but fairly common in September when it was generally met with in company with hunting bands. It usually perches on the inner boughs, of trees and hawks within the spread of the boughs, or in open spaces between the trunks of trees; the note is loud, harsh and distinctive and is frequently uttered.

615. The Dark Grey Bush-chat—*Oreicola ferrea* (Hodgs.).

A pair were haunting our garden by the Upper Bakrota Mall in June; in September their progeny were also to be found there. A few were also noted in other localities.

The species was, I think, common below Dunera along the tonga-road in June, but had disappeared by September.

630. The Western Spotted Fork-tail—*Henicurus maculatus* (Vig.).

One was met with in September on a stream in the catchment area beyond Bakrota; the species was reported to me from the same place in June.

638. The White-capped Redstart—*Chimarrhornis leucocephalus*, Vig.

Reported from the above stream in September.

661. The Brown-backed Indian Robin—*Thamnobia cambaiensis* (Lath.).

A common bird along the lower portion of the tonga-road and met with as high as Haled Post. It does not of course occur in Dalhousie.

663. The Magpie-Robin—*Copsychus saularis* (L.).

A few individuals were met with along the tonga-road in both June and September, but none were noted at a higher elevation than Dunera.

673. The Grey-headed Ouzel—*Merula castanea*, Gould.

An Ouzel seen on the upper Bakrota Mall in September appeared to be of this species.

676. The Grey Winged Ouzel—*Merula boulboul* (Lath.).

Common on Bakrota and met with both in June and September. A nest was found containing a single naked nestling on 3rd June; this nest was a cup of moss with a mud lining, and was placed about 10 feet from the ground in a fork of an evergreen oak in tree jungle on a steep khud side. The parent birds were most excited whilst we were in the neighbourhood of the nest.

690. The Chestnut-bellied Rock Thrush—*Petrophila erythrogastra* (Vig.).

This Rock-Thrush was distinctly common both in June and September, and in the former month was evidently breeding. It is usually found in the higher tree jungle perching in trees, and is not particularly partial to undergrowth. Specimens obtained in September were very deep in moult.

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691. The Blue-headed Rock Thrush—*Petrophila cinclorhyncha* (Vig.).

A few specimens were met with in September. This species differs fr the last in being usually found in a lighter and more open type jungle.

741. The Black and Yellow Grosbeak—*Pyenorhamphus icteroides* (Vig.).

One of the common birds of Bakrota both in June and September, severa being often found together in company. Although usually frequenting the tops of high trees in the pine forests it descends freely to feed both on the ground and in low undergrowth. The species is possibly double brooded as a female shot on the 6th September had an incubation patch and there were well-developed eggs in the ovary.

772. The Himalayan Greenfinch—*Hypacanthis spinoides* (Vig.).

The Greenfinch was not observed in June, but was found to be most abundant at 7,000—7,500 feet in September; the cheerful calls of small parties as they flew overhead were to he heard at all times of the day. Like the English species they were very partial to sunflowers, and small green seeds found in the crops of birds shot were probably immature seeds of that plant. Three males collected all had enlarged testes.

780. The Cinnamon Tree-Sparrow—*Passer cinnamomeus* (Gould.).

In June this sparrow was common around our house and garden where it took the place of *Passer domesticus*, frequenting the trees and bushes. Although it is a tree rather than a roof sparrow, I found 4 eggs on 11th June in a nest built under the eaves of the house. This nest was a bulky mass of grass, feathers, wool, pieces of hair, etc., and was only taken after the removal of several slates from the roof. The eggs measured, respectively, 19×14; 19·5×14·5; 19.5×14; 19·5×14·5 mm. Two were addled, two hard set. The note is rather different to that of *P. domesticus*. None were observed in September.

794. The Eastern Meadow Bunting—*Emberiza stracheyi*, Moore.

A very fine male was seen on the Upper Bakrota Mall in June.

805. The Kashmir Martin—*Chelidon kashmiriensis*, Gould.

A number of swallows seen flying round the top of Bakrota on 9th September were probably of this species and on migration. It was not otherwise observed, nor did I see nests on any houses.

813. The Swallow—*Hirundo rustica*, L.

On 27th May and 13th June the swallow was common all along the tonga-road from the lowest hills upwards, and it was evidently breeding. An occasional party used to visit our house by the upper Bakrota Mall between those dates. But when I again passed up the tonga-road on 28th August only a stray bird or two were to be seen. It is interesting in this connection to note that the species was first seen in Gujranwala by me on the 19th July, and it had become common there by the first week in August; so it is probable that the numbers seen in Gujranwala were birds migrating from the Himalayas.

818. The Wire-tailed Swallow—*Hirundo smithii*, Leach.

Noted along the lower parts of the tonga-road in both June and September, but not observed higher than Dunera. It breeds commonly under bridges and culverts in all the lower hills.

819. The Indian Cliff Swallow—*Hirundo fluvicola*, Jerd.

A flock was seen from the train in June; they were frequenting (and probably nesting under) the Railway bridge over the canal near Pathankote station.

823. Syke's Striated Swallow—*Hirundo erythropygia*, Sykes.

A striated swallow, which I attributed to this species was found in company with *Hirundo rustica* all along the tonga-road on 27th May and 13th June; it was nesting under the culverts of the road, and was rather more

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numerous than *H. rustica*. Between those dates an occasional party appear-
in our garden, as in the case of the other species.

Only a few small parties were seen along the tonga-road on 28th August.
In two or three days in September a single individual appeared in the
garden where it was seen to settle occasionally and pick up food from the
grass on the Badminton Court.

832. The Grey Wagtail—*Motacilla melanope*, Pall.

Noted as follows on the autumn migration :—

28*th August*—6 individuals seen along the tonga-road in various places above Dunera.

30*th August*—One seen in our garden by the Upper Bakrota Mall.

7*th September*—One seen in our garden by the Upper Bakrota Mall.

10*th September*—One bird and two others seen on the Upper Bakrota Mall.

946. The West Himalayan Scaly-bellied Green Woodpecker—*Gecinus squamatus*, (Vig.).

A few of these Woodpeckers were met with both in June and September.

961. The Western Himalayan Pied Woodpecker—*Dendrocopus himalayensis*, (Jard. and Sebly.).

The commonest Woodpecker in Dalhousie in both June and September; it comes freely into gardens.

969. The Brown-fronted Pied Woodpecker—*Dendrocopus auriceps*, (Vig.).

A male was shot on Upper Bakrota on 9th September, and another individual was seen by the tonga-road near Nana Khad on 28th August. The species would seem to be much less common here than in Murree Hill station where it is most abundant.

1006. The Great Himalayan Barbet—*Megalæma marshallorum*, (Swinh.).

A few were seen or heard in both June and September.

1068. The Alpine Swift—*Cypselus melba*, (Linn.).

I believe I saw an Alpine Swift flying over Bakrota on 9th September, but was unable to obtain a second view of it. The species is to be expected there on migration.

1073. The Common Indian Swift—*Cypselus affinis*, Gray and Hardw.

Common at all heights from the plains upwards in May and June. A colony of nests built in our verandah were found to contain fresh eggs on 7th June. This colony still sheltered a few birds in September in spite of efforts which had been made to drive them away. Only a few birds were noticed along the tonga-road on 28th August.

Nightjar—*Caprimulgus*, sp. ?

On 4th September a Nightjar was seen flying above the Upper Bakrota Mall at dusk.

1104. The Cuckoo—*Cuculus canorus*, Linn.

The Cuckoo was frequently heard calling in the jungles around Bakrota in June, but it was not observed on my second visit with the possible exception of one seen near Tukoh stage of the tonga-road on 28th August.

1105. The Himalayan Cuckoo—*Cuculus saturatus*, Hodgs.

On Bakrota in June a second species of Cuckoo was not uncommon, which from its Hoopoe-like call I attribute to this species.

1129. The Sirkeer Cuckoo—*Taccocua leschenaulti*, Less.

A curious bird seen on the tonga-road on 28th May at the beginning of the foot hills near Nurpur was probably of this species, which I have not otherwise met.

1139. The Western Blossom-headed Paroquet—*Palæornis cyanocephalus*, (L.).

Found commonly on Bakrota in June and also met with in the foot-hills along the tonga-road. Not observed in September.

1186. The Collared Pygmy Owlet—*Glaucidium brodiei*, (Burton.).

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One of these tiny owls was seen sitting on a bough of a fir tree just before dusk in the catchment area on 6th September. It was possibly this species of owl which was heard calling on most nights in September on Bakrota, but I do not remember hearing the call in June.

1191. The Black or Pondicherry Vulture—*Otogyps calvus*, (Scop.).

One or two of these handsome vultures were noted about Dalhousie.

1193. The Himalayan Griffon—*Gyps himalayensis*, Hume.

A fine Griffon Vulture, which I attributed to this species, was met with frequently both in June and September at all elevations from Pathankote to Bakrota.

1196. The Indian White-backed Vulture—*Pseudogyps bengalensis*, (Gm.).

Met with as high as Bakrota over which hill individuals were often to be seen soaring.

1198. The Egyptian Vulture—*Neophron percnopterus*, (L.).

Abundant of course from the plains up to Bakrota both in June and September.

1199. The Bearded Vulture or Lämmergeyer—*Gypætus barbatus*, (L.).

Met with occasionally both in June and September around Bakrota. One morning a fine adult flew round the garden so low and so persistently that I was tempted to try and secure it with a small ·410 collecting gun.

1217. The Crested Serpent Eagle—*Spilornis cheela*, (Lath.).

A fine adult male was secured in the foot-hills below Dunera on the tonga-road on the 28th May.

Note.—In September a very fine pair of Eagles which I could not identify were frequently to be seen wheeling high about Bakrota, uttering a call that was new to me. These were possibly the same as a pair of birds observed to haunt the catchment area on Bakrota. A second (or third) pair of large Eagles with very white underparts were seen on one occasion soaring over the catchment area.

Kite—*Milvus*, sp.?

Some species of Kite was common on Bakrota in September but I failed to obtain a specimen for identification.

1265. The Kestrel—*Tinnunculus alaudarius*, (Gmel.).

Several Kestrels were seen along the tonga-road in the lower ranges in June, and one or two were met with around Bakrota. Only one was seen on the tonga-road on 28th August.

1305. The Indian Turtle Dove—*Turtúr ferrago*, (Eversm.).

Common in September on Bakrota, and probably migrating.

1307. The Spotted Dove—*Turtur suratensis*, (Gm.).

Common along the tonga-road amongst the lower ranges in both June and September, and noted as high as Balun.

1309. The Little Brown Dove—*Turtur cambayensis*, (Gm.).

Common along the tonga-road as far as Dunera, but not observed above that height.

1310. The Indian Ring Dove—*Turtur risorius*, (L.).

Common along the lower parts of the tonga-road, but possibly not extending quite so high as the last species.

Pheasants.

One surprised in the catchment area of Bakrota on 10th September was apparently a Koklas (*Pucrasia macrolopha*), whereas another found feeding at dusk on the Bakrota Mall in June was more probably some species of Kalij (*Gennæus*).

1375. The Grey Partridge—*Francolinus pondicerianus*, (Gm.).

On 28th August a few were noted along the tonga-road between Pathankote and Dunera, at which latter place I saw a pair of old birds with their young.

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MISCELLANEOUS NOTES.

No. I.—INDIAN MARTENS (*MARTES FLAVIGULA*) FEEDING ON NECTAR.

While making a march in February through Tehri-Garhwal I noticed a pair of martens climbing about a rhododendron tree. The tree, which was in full flower, was only forty yards below the track along which a stream of baggage coolies was passing. But the martens paid no notice and kept climbing about the branches visiting one cluster of flowers after another. At first I thought that they were eating the flowers (the corolla is eaten by hungry coolies at a pinch), but on getting out my glasses I saw that the flowers were left uninjured. The beasts were thrusting their noses into the flower cups and from the motion of their head, it was clear that they were licking up the nectar, a large drop of which is formed at the base of each flower. I have seldom seen a prettier sight, for the deep red blossoms showed up to perfection the martens' lovely fur. It was also amusing to find such bloodthirsty little beasts enjoying such innocent fare. But this habit is probably not uncommon. I have since been told by a friend that he once saw a pair of martens behaving in a similar fashion in a silk-cotton tree which was in flower.

G. B. F. MUIR, I.C.S.

MAYO COLLEGE, AJMERE,
March 1916.

No. II.—SEROW (*CAPRICORNIS RUBIDUS*) ATTACKING CART—BULLOCKS.

I herewith have the pleasure of submitting to you the experience of one of my cartmen which appears to me quite unique in the history of shikar accidents.

On the 27th of March 1916 at about 11 a.m., he was proceeding with a cartload of goods from Thandaung to the Hotel Quisisana, along a P. W. D. road when suddenly a "Mountain Goat" (Serow) dashed out from the jungle and attempted to attack the bulls of the cart. The man immediately jumped down and hit the goat with a big stick across the head which temporarily stunned the animal. He then took up his dah and gave it another clout across the ear, which broke the dah in two as well as giving the animal its *coup de grace*. He then lifted it into the cart and brought it to my house which is about 1½ miles from the place where the attack took place.

I was so surprised at the story that I would hardly credit the same for I could not understand how a man could finish off a Serow with a stick when huntsmen in these parts take days to see one. I got Mr. W. R. French of the Burma Forests to come and inspect and see that there were no bullet marks on the goat.

A. T. WERNIGG.

THANDAUNG, BURMA,
27th March 1916.

No. III.—ALBINO HOG DEER (*CERVUS PORCINUS*).

Through the kindness of Mr. F. Field, Rutlam, we have received the following cutting from the "Statesman":—

"While out shooting in Cooch Behar State with H. H. the Maharaja, an albino female hog deer was shot. It was a full-grown specimen and white

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all over with the exception of a few pale straw coloured lines radiating from the angles of the mouth on each side. The hoofs were also white. It appeared not to be merely a white deer but a true albino as the eyes were pink. I have seen other animals, such as buffaloes claimed as albinos, but the character of the eyes was absent. This, I believe, is an unusual occurrence in hog deer. The head shikari, who has had forty-five years' experience, has never seen a similar case before. Perhaps some of your sporting readers have. The specimen is being sent to Rowland Ward for preservation."

G. PERCEVAL ADAMSON,
Civil Surgeon.

COOCH BEHAR STATE, *Feb.* 26.

[So far as we know there does not appear to be any previous record of albinism in the Hog Deer.—EDITORS.]

March 1916.

No. IV.—NOTES ON A YOUNG INDIAN PANGOLIN OR SCALY ANTEATER (*MANIS CRASSICAUDATA*).

On 31st August last, some members of a criminal tribe (usually the best field naturalists) brought me a young Pangolin, 14 inches long, colour dirty pink on the scales and white on the claws and belly. For a week it fed by dipping its tongue in milk, but got weaker and weaker until forcible feeding with a sponge was tried, when it showed a desire to suck the sponge. The step to a small rubber nipple and a baby's bottle was easy and for three months it was fed 3 times a day and drank about one-third of a pint of two-thirds cow's milk to one-third water daily. It fed, for preference, standing up, was very healthy, but died on my transfer to a colder district early in December, by which time it had nearly doubled its weight.

Its prehensile activity was very marked and when on the ground it would at once make for a human or a chair leg and climb it like a bear. The prehensile force of the broad tail was like a clamp. A favourite game was to crawl round the edge of a basket, gripping the inner edge with the tail. It was highly sensitive to cold, would doze in the sun and always wrapped its body up in a cloth before sleeping at night. Often it assumed an erect posture snifling the air. Efforts to make it eat white ants failed, though it would dig violently in their nests. Its habits were certainly diurnal and on waking every morning it would thrust out 4 inches of pink tongue by way of a yawn and at once fuss around until fed. Small bristles grew sparsely between the scales. It walked on the knuckles of its fore-paws and followed my chaprassis like a sheep at a shambling trot. I doubt whether it could see at all during the time I kept it, but it could certainly smell and was extremely sensitive to all sounds, a sudden shout causing it to curl up at once. I have no idea of its age.

C. G. CHEVENIX TRENCH, I.C.S.

BETUL, C. P., *March* 28*th*, 1916.

No. V.—NOTES FROM THE GHARWAL HIMALAYAS.

The following Notes were put together on a trip into "Gharwal" undertaken in October and November of the year 1915 :—

The writer had proposed to try for Burhel on the "massive" of "Trisul" 23·406 feet, as they are to be found at this time of the year on an

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open Down named "Burhel tola" 15,000 feet, but could not make it, on account of the storms that came up every afternoon and covered the Range with mist and sleet.

On the way up many flocks of sheep and goats were met, being brought down by the shepherds, which foreshadowed the result, as they stay up in the high feeding grounds as long as they possibly can, the grass being most excellent and the growth of heavy wool being accelerated by the cold. The rough stone huts and fierce Tibetian dogs keeping off snow leopards and bears. However a shepherd was heard on the opposite hill side shouting to his companion in a great state, that a Bear had just killed a sheep. At the highest camp Quarie 13,000 feet, the snow could be seen being blown off the cornices of the three peaks or tridents of "Trisul" and several snow avalanches were watched. This southern side of the mountain was found impracticable by Dr. Longstaff and he ultimately ascended from the northern side.

At 14,000 feet after leaving the Quarie Camp for Beddinge, two wild-dogs *Cyon dukhunensis* were seen. These pests are now very numerous in Gharwal and Kumaon, and Rs. 30 is being offered as a reward for a single animal. Below the Quarie Camp near the edge of the forest the shikari came upon some dung of the Musk-deer "Kastura" and handed some to the coolies who at once rubbed it in their hands at the same time smelling it with intense pleasure. They all then sat down and proceeded to mix some with tobacco which they smoked.

Locusts, *Acridium peregrinum*, have been very bad in Kumaon and Gharwal this year and a large flight was seen just below Wan in Gharwal at 8,000 feet, while 3 were observed flying over "Quarie" at 13,000 feet. The cold of the early morning seemed to paralyse them but they revived about 11 o'clock and flew off. The writer noticed that Tahr (*Hemitragus jemlaicus*) unlike Markhor, Ibex and wild sheep have not good sight and did not easily pick him up either when below or on the same level.

It is supposed that the nature of the precipitous ground they live in is their protection. Mr. Norman Troup, the veteran planter and shikari of "Kaumoan" told the writer that on two occasions he had seen leopards chasing Tahr, on one of these occasions the animal was a snow-leopard (*Felis uncia*) and on the other the ordinary hill panther (*Felis pardus*). On both occasions they missed their quarry. The snow leopard made a rush down a very steep declivity, but the Tahr, a young animal, jinked to one side and the leopard overshot his mark badly and went on. Mr. Troup added however that on one occasion he found the fresh remains of a Tahr killed by a panther. Still it is thought that the nature of the ground is as before stated their best protection. The shikari scouted the idea that wild dogs or panthers killed any but very young ones.

Moonal pheasant were very plentiful and "planed" down into the valleys on being flushed from every crag above the forest limit; each cock being invariably accompanied by two hen birds. Whole farm-yards of the "Kalij" pheasants were seen in the lower ranges 7,000′ to 5,000′ and the sexes seemed to be in the same proportion. On one occasion three cocks and three hens were seen all together.

At Gwaldom Tea Estate the record "Jerai" head 46½ inches was examined (see Rowland Ward's Records of Big Game). It is not however a pretty head and Mr. Nash has a much better example of the "Jerai" antlers though they have not the length of the record pair. The pony, the writer used, got so fat on the grass and leaves of the *Potentilla fragaria* or fruitless strawberry up at the Quarie Camp that in passing on a narrow ledge he threw up his heels and kicked the writer but did no damage. The

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sheep and goats eat these leaves with avidity and the coolies were also observed to chew one occasionally.

R. H. HEATH.

AHMEDABAD, *November* 1915.

No. VI.—NOTES ON SOME BULBULS FROM THE BHAMO DISTRICT (SINLUM KABA, KACHIN HILLS).

Swinhoe's Bulbul (*Hemixus holti*). At Sinlum on the 8th of May 1913 I found a nest of this species. The nest, a very flimsy structure, cup-shaped, was entirely made of bamboo leaves, held together by long thin pieces of moss and cobwebs, and lined with a little grass. It was suspended cradle-like after the manner of the orioles nests, between some stems of dead bracken about 3 feet from the ground. The inside measurements were as follows:—Diameter 2⅜ inches, depth 1 inch. It contained two eggs in a fairly advanced state of incubation. In colour and markings they were alike, having a whitish ground colour profusely speckled all over with reddish brown spots, and having the unmistakable appearance of bulbuls' eggs. In shape and size there was a remarkable difference between the two eggs, one measured 1·06 inches by ·7, the other ·97 inches by ·72. There appeared to be no attempt made to conceal the nest, excepting that the small clearing it was in, consisting chiefly of dead brambles and bracken, was surrounded by very thick jungle. I came across it quite by accident and very nearly upset it by treading on some briars which had become mixed up with the bracken. The first thing that struck me was, that the size of the eggs appeared to be out of all proportion to the size of the nest. Of course the bird had gone, so I went away for some time, and on returning quietly I saw one of the birds sitting on the nest, which it almost entirely covered; in fact there was scarcely any nest to be seen. It flew away on my approach, but soon appeared again with its mate, and until then I was unaware that even bulbuls could make such a noise. I shot one of the birds, and it agreed with the description of *Hemixus holti*, (as differing from *H. macclellandi*) by Major H. H. Harington in his list of "The Birds of the Bhamo District," published in this Journal, Vol. 19, p. 107, (No. 274*a*).

I do not think that the nest and eggs of this species have been recorded from the Kachin Hills before, so think it may be of interest as extending its breeding area.

Referring to "The List of the Birds of the Bhamo District" by Major H. H. Harington, Vol. 19, p. 107, the following may be of interest:—

He says with regard to the Finch-billed Bulbul (*Spizixus canifrons*) (No. 292)—"It lays two eggs. I never found three in one nest." At Sinlum, on the 24th April 1913, I found a nest containing three eggs, and on the 6th of May 1913 I found another nest containing three slightly incubated eggs. Writing of Anderson's Bulbul (*Pycnonotus xanthorrhous*) (No. 298*a*), he says: "It almost invariably lays three eggs, only on one or two occasions I have taken two incubated eggs." At Sinlum on the 15th of May 1913 I took a beautiful clutch of four eggs, in an advanced state of incubation.

I found a great number of nests of these two last named Bulbuls at Sinlum, and my observations entirely agree with Major Harington's, with the three above quoted exceptions, and also that all the nests of *P. xanthorrhous* I found were in bracken and none in long grass or weeds.

STANLEY PERSHOUSE, MAJOR,
The Border Regt.

CARLISLE, 1915.

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No. VII.—NIDIFICATION OF THE GREEN SHRIKE-TIT (*PTERUTHIUS XANTHOCHLORIS*).

I have read with interest an account of the above by Mr. A. E. Jones on page 369 of Vol. XXIV of the Journal in which he states that the nesting of this species had not been previously described. If he will refer to pages 65 and 469 of Vol. XI of this Journal he will find descriptions of two nests and eggs of this bird found by me in 1896 and 1897, respectively. His and my descriptions agree in all essentials, but I venture to think he is wrong in saying that the lining of the nest consists of "black stems of the maiden hair fern." If he examines the substance forming the lining more carefully I feel sure he will find it is not fern rachis at all, but the rhizomorph of a fungus, much resembling the former. This rhizomorph hangs down in long black hair-like filaments from the branches of trees in damp jungle and is much used by a variety of birds, *e.g.*, *Liothrix lutea*, in the construction of their nests.

B. B. OSMASTON, I.F.S.

DEHRA DUN,
14*th March* 1916.

No. VIII.—THE OCCURRENCE OF THE BRISTLED GRASS-WARBLER (*CHÆTORNIS LOCUSTELLOIDES*) AT LAHORE.

There is every indication that with the increase of irrigation in the Punjab, the avifauna of the Province is also gradually changing. I have already recorded the finding at Lahore of the Long-tailed Grass-Warbler (*Laticilla burnesi*) and the Rufous-backed Sparrow (*P. pyrrhonotus*) (*vide* Vol. XIX, p. 258 and 259 of this Journal).

Both of these birds had not formerly been recorded from Lahore, which I think is attributable to the fact that they had but recently extended their range to the Punjab, as I think it very unlikely that such an able ornithologist as Col. Marshall who was at Lahore would have overlooked them, and in corroboration there is the fact that the Bristled Grass-Warbler, which according to the *Fauna* has not been procured further north than Etawah, Cawnpore, Dinapore and in Oudh, now breeds at Lahore in the hot weather. This occurred to the best of my knowledge for the first time in 1914 as though I have visited their breeding ground regularly in September for the last six years, I have never come across one and this is not a bird that easily escapes attention, the cock bird continually soaring round in wide circles while singing and his monotonous chirrup of a song being audible for quite a long distance. The place where these birds breed at Lahore is the grass rakh belonging to the Forest Department which quite recently has been enclosed and well irrigated and is now covered with clumps of tall grass and in the hot weather is a veritable quagmire. I observed the birds on my first visit to the rakh in the middle of July, but though the males were all in full song, the birds did not appear to have actually commenced breeding operations. I had to leave Lahore in the meantime and could not visit the rakh again till 13th September 1914 when I discovered a nest containing young about a fortnight old in the middle of a large clump of grass, but my search for further nests was considerably hampered by the swampy nature of the ground. I did not again get an opportunity of visiting the rakh till Xmas time when I found to my astonishment that all the birds had completely disappeared, from which it would appear that the birds are at present only migrants during the monsoon to Lahore. I would mention that I shot a cock bird

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for purposes of identification on my first visit to the rakh and the curious arrangement of the rictal bristles left the identity of the species out of question. The rakh in question was the only locality round Lahore where I met with the species.

A. J. CURRIE.

RANGOON, *December* 1915.

No. IX.—THE OCCURRENCE OF THE GREEN MUNIA (*STICTOSPIZA FORMOSA*) AT LAHORE.

The *Fauna* gives the northern and western limits of this species, respectively, as Jhansi and Mount Abu, so its occurrence at Lahore is an extension of its range. Though I cannot say for certain that it does not occur at other times of the year, I have only seen it at Lahore in August when it breeds and it is very possibly one of those species which is only found there during the monsoon. I have only found its nest in the Lawrence Gardens on the 24th and 28th August, in evergreens, one nest being situated in a small fir tree, and the other four I found being so far as I can remember all in the same tree, a prickly evergreen (*Aureicola*) which grew close to the band-stand but has since I think been cut down. Six eggs appear to be the full clutch as I found this number on two occasions.

A. J. CURRIE.

RANGOON, *December* 1915.

No. X.—NOTES ON THE PUNJAB CUCKOOS (*CUCULINÆ*).

There are seven species of the sub-family *Cuculinæ* found in the Punjab, and I give below a few notes on what I have been able to observe concerning each.

1104. The Cuckoo (*Cuculus canorus*).—I have shot several specimens of this Cuckoo at Lahore in September and have both seen and heard it as early as the 16th July, while I have seen and heard it at Gujranwala (30 miles north-west of Lahore) on the 7th April, so it would appear to pass through Lahore on both migrations though not so plentifully in the spring. I have also come across it at Abbottabad (4,000 feet) in the middle of May and found it extremely plentiful at Malikpur in the Gurdaspur District at the end of July. I saw a few individuals at Gurdaspur in August. It of course breeds all along the Himalayas and I have found its egg in the nest of the Indian Blue Chat, and the Streaked Himalayan Laughing-Thrush at Dunga Gali in June. The egg in the Chat's nests, which had young, was addled and was a uniform pale blue while the egg in the Thrush's nest was pale blue very faintly blotched with purple round the larger end.

1105. The Himalayan Cuckoo (*Cuculus saturatus*).—I shot a Cuckoo at Lahore in September which was considerably smaller than *C. canorus* and very dark above with a stouter bill, which I attributed at the time to *C. canorus* but which I now think may have been the present species. However I have not now got the skin for reference. This Cuckoo also breeds in the Himalayas and I have found its egg in the nest of the Large Crowned Willow-Warbler (*A. occipitalis*) and the Large billed Willow-Warbler (*A. magnirostris*).

In both cases the nests contained 3 fresh eggs in addition to the Cuckoo's egg on 29th and 24th June, respectively. The Cuckoo's eggs, which were

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similar in each case, were long ovals, white, sparsely dusted with light brown and from the propinquity of the nests which were about 50 yards apart might have been laid by the same bird.

1107. The Indian Cuckoo (*Cuculus micropterus*).—I have heard this bird at Dunga Gali and Murree in the hot weather and seen it on one occasion, but it is far from common at either of these places.

1109. The Common Hawk Cuckoo (*Hierococcyx varius*).—I only heard and saw this bird at Amballa and Hoshiapur in the Punjab in March and I had no opportunity of ascertaining whether it remains during the hot weather at these places. In any case this would appear to be an extension of its range.

1112. Indian Plaintive Cuckoo (*Cacomantis passerinus*).—This bird is a migrant to Abbottabad where it arrives in the latter end of May and I have also heard it at Dharmpur below Kasauli (Simla Hills) in the middle of the hot weather. Abbottabad would appear to be a considerable extension of its range.

1117. The Drongo Cuckoo (*Surniculus lugubris*).—As I was lying in bed early one morning at Lahore, I heard 5 or 6 notes ascending the scale in perfect gradation repeated at intervals which I at first attributed to human agency, but as the sound continued and I knew that there could be no one about at that early hour (dawn was just breaking) I went outside to investigate and discovered what I took to be a King Crow which flew out of a tree close at hand and was the only living thing in sight or within hearing. It was not till some time later that I read an account of the Drongo Cuckoo and realised for the first time that what I had then heard and attributed to the mimicry of the King Crow was doubtless the note of this Cuckoo. This was on the 12th October and is the only occasion I have come across this bird, when it was doubtless on migration.

1118. The Pied Crested Cuckoo (*Coccystes jacobinus*).—I have never come across this bird in Lahore earlier than 1st June or later than the end of September, though I once saw a young bird being fed by a pair of Common Babblers (*Argya caudata*) on October 16th.

I found an egg in the nest of the Common Babbler on the 6th September and have seen a young bird being fed by a pair of Jungle Babblers (*Crateropus canorus*).

I once heard this Cuckoo at night at Murree in the hot weather.

A. J. CURRIE.

RANGOON, *December* 1915.

No. XI.—THE BREEDING OF THE KOEL (*EUDYNAMIS HONORATA*, LINN.).

With reference to the Editors' footnote on p. 192 of the current volume of our Journal I send herewith a table of the instances when I have met with Crow's nests in the Punjab, containing eggs of the Koel. It is to be regretted that I cannot get at my collection at present to supply the missing measurements, as it is of interest to compare the relative sizes of the eggs of the foster parent and parasite.

The numbers of the Crow's eggs and the relative difference between their incubation and that of the Koel's eggs suggest that one or more eggs belonging to the rightful owner of the nest are ejected by the Koel when she visits the nest.

With regard to the instance of seven eggs recorded by Mr. Jacob it is to be regretted that the record was not properly authenticated, but rests

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merely on the word of the orderly who climbed the tree; in my experience it is not every climber who can with certainty distinguish the eggs of the two species when in the nest.

Date and Locality.	Eggs of *Eudynamis honorata*.		Eggs of *Corvus splendens*.	
	Number.	State of incubation, etc.	Number.	State of incubation, etc.
26th June 1913, Jhelum.	1	Moderately incubated.	3	2 fresh; 1 slightly incubated.
26th June 1913, Jhelum.	1	Slightly incubated; measured 30·5 × 22 mm.	3	fresh.
26th June 1913, Jhelum.	2	1 fresh; 1 slightly incubated; measured 30·5×23·5 and 31×23·5 mm.	1	Not recorded.
11th July 1913, Jhelum.	1	fresh; measured 32·5 ×24·5 mm.	3	fresh.
12th July 1913, Jhelum.	3	fresh; measured 33·5 × 23; 31·5 × 24·5; 30×21·5 mm.	..	....
23rd June 1915, Gujranwala.	1	fresh; measured 34 × 25 mm.	2	fresh; measured 35 × 25·5 mm.
30th June 1915, Gujranwala.	3	one addled: one incubated; one contained living chick: measured 32 × 24·5; 33·5×25; 30·5×22 mm.	1	addled; measured 35·5 ×26·5 mm.
5th July 1915, Gujranwala.	1	contained a living chick.	5	Rather incubated.

HUGH WHISTLER, M.B.O.U.,
Indian Police.

AMBALA CITY,
5th February 1916.

No. XII.—BUZZARD (*BUTEO DESERTORUM*) AND SHRIKE (*LANIUS*, SP.)

As I was riding along a road in Ajmer, a Buzzard swooped down (probably out of a tree) just in front of my horse and seized a Shrike at the side of the road. A crowd of crows and seven sisters gathered round, clamorous with indignation, but the Buzzard eyed them very coolly for a minute or so and then flew up into a tree to devour its prey. It allowed me to watch from ten or twelve yards distance. It took some pains to get rid of the longer feathers but otherwise devoured the whole of its prey including the head and feet. The whole process took twenty minutes. The Shrike's body was balled up in the Buzzard's talons and I could not distinguish the species, but the broad black band like a burglar's mask, across the face was clearly visible and left no doubt that the victim was a Shrike. And this to me was the interesting point, for, from the conspicuous colouring of Shrikes and the

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bold and apparently careless way in which they habitually expose themselves, I had supposed that they must for some reason be safe from attack by larger birds of prey; but evidently hawks will take them, if they get the chance.

G. B. F. MUIR, I.C.S.

MAYO COLLEGE, AJMERE,
March 1916.

No. XIII.—NOTES ON THE PAINTED BUSH QUAIL (*MICROPERDIX ERYTHRORHYNCHUS*), F.B.I. 1359.

As its name implies this bird is seldom found in any but light scrub and is very partial to the scrub that springs up in fields that have lain fallow for some time. This scrub as a rule mainly consists of what is known in Tamil as "Verali" (? a species of senna).

It is rarely found in heavy or even moderate jungle unless this be on the edge of cultivation. These birds are generally found in small coveys of 6 to 10 in number and with a dog there is never any difficulty in flushing them. (*Note.*—I find this applies also to *M. inglisi* as in 1913 my dog kept constantly putting up parties of this bird—Alex M. Primrose.) When thus dispersed they, after a short interval, begin calling to each other and in a short time get together again. This call is a very soft whistle of about 2 seconds, duration repeated after about the same interval and rising gradually till it reaches a certain pitch which note is repeated a few times and then dies down rather more rapidly; this same call constitutes that of the hen, the male's call is graduated in the same way but has a "kill" in it and I think is best expressed on paper as "kirikee," "kirikee," etc. I have tried imitating this call and find that with a little practice it is very easily done. The birds come to the call readily from short distances, that is up to about 80 or 100 yards. You can, if you hear the birds calling a little distance away, start answering them; soon you hear the bird calling nearer you and a little more answering on your part brings him nearer still. Now you hear him calling close by and very often spot him standing on a small rock or other eminence waiting an answer to his challenge. Then once he has located the sound he comes along at a very fast walk or run, now and again making a sort of chuckling noise and looking about for his would-be antagonist, but should the bird see you instead, which it generally does, being by this time not more than one or two yards distant, he retires uttering an alarm note. The best time for calling them in this way is when they are mating as then they seem to be "on the war path" in earnest.

The nesting season or rather seasons, for I am sure this Quail nests twice in the year, are March, April and May and again in September and October. The nest is very difficult to find and consists of a small depression in the ground with perhaps a thin lining of grass. It is generally placed at the roots of a bush or clump of grass. The eggs vary from 8 to 10 in number. They are a pale buff with a fair gloss and are conical, that is, there is a fair amount of taper from the broad end.

C. PRIMROSE.

KIL KOTAGIRI, NILGIRIS,
9th August 1911.

[On looking over some old bird notes the other day I came across the above note by my brother A. M. Primrose.—C. P.]

3rd April 1916.

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No. XIV.—CORMORANT (*PHALACROCORAX CARBO*) AND FISHING EAGLE (*HALIAËTUS LEUCORYPHUS*).

I was watching a Cormorant fishing in a pool in the Ganges. The bird came to the surface with a fish which looked like a young mahseer and must have weighed over a pound. The fish was held by the nape, but I could not see whether the grip was over the gills or behind them. The grip seemed partially to paralyse the fish, for its body and tail were bent stiffly to one side and its struggles were spasmodic and feeble. Nonetheless the Cormorant seemed unable to do more than hang on and wait till the fish became exhausted. I was watching the struggle with great interest through a pair of field glasses, wondering how it would terminate, when suddenly and much to my surprise, I saw the Cormorant let go and both fish and bird disappear beneath the surface. Lifting my eyes from the glasses I saw a Fishing Eagle swinging round a few feet above the spot. It had evidently just failed to catch the Cormorant napping. The Eagle veered off and settled on a ledge of the cliff just above the pool. A second or two later the Cormorant emerged at the foot of the cliff and, climbing on to a half-submerged rock, began peering round in all directions for signs of his enemy. Owing to a bulge in the face of the cliff neither bird could see the other. After two or three minutes the Eagle flew off downstream, but the Cormorant remained peering about in evident anxiety for quite ten minutes before it found the courage to leave the shelter of the cliff. It then flew up stream and out of sight.

G. B. F. MUIR, I.C.S.

MAYO COLLEGE, AJMERE,
March 1916.

No. XV.—TERNS HAWKING OVER GRAM FIELDS.

For some days I have noticed many Terns both *Hydrochelidon hybrida* and *Sterna anglica* hawking over the gram fields here. The only cause to which I can attribute this is that this year, here at any rate, the Pusa white gram is badly infected with what I take to be the gram caterpillar (*C. obsoleta*) which enters the pods and eats the grain. Every now and then the Terns swoop down to the gram and probably pick off the pests.

CHAS. M. INGLIS.

BAGHOWNIE FTY.,
LAHINA SARAI,
2nd April 1916.

No. XVI.—GULLS FEEDING ON TERMITES.

There are two species of small Gulls (not Terns) in the River Shatt-el-Arab. On the evening of 12th March I noticed a large assembly (perhaps 200) of these birds circling about as one sees them over fish nets when drawn ashore from the sea. It was not until I came quite close to them that I discovered fish were not their objective, but termites, a nuptial flight of which was rising from the river bank.

F. WALL, C.M.Z.S., F.L.S.,
LT.-COL., I.M.S.

BASRA,
13th March 1916.

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XVII.—THE PINK-HEADED DUCK (*RHODONESSA CARYOPHYLLACEA*, LATH.) IN THE PUNJAB.

On 21st March last Mr. R. B. Whitehead, I.C.S., and myself were out observing on the sandbanks and islands of the River Sutlej just about the headworks of the Sirhind Canal at Rupar in Ambala district when we came across two curious ducks. They were sitting on the edge of an island by the water in company with some half dozen Common Cormorants (*Phalacrocorax carbo*), and were less shy than the Cormorants, remaining on the sand after the latter had flown away at our approach. Unfortunately our attempt to secure one was hindered by my fox terrier who chased the quarry and although we followed them to two or three different places where they settled either on sandbanks or in shoals we failed to secure one. As far as could be seen with the naked eye and glasses of moderate power these ducks were little inferior in size to a goose, of a brownish colour with a good deal of white in the wings, and head and upper portion of the neck of a most noticeable rose-pink colour. I have never had an opportunity of seeing the Pink-headed Duck in life before or of examining a skin, but feel certain that these two birds were of that species. I know of nothing else that they could be, but the size and body colour seem a little wrong: however it may be remembered that the estimation of size is a difficult matter on these wide expanses of sand and water, while the lightness of colour might be due to worn and faded plumage as mentioned by Mr. Stuart-Baker in his account of the species. At any rate I am so satisfied myself of the identity of the birds seen that it seems worth while to record the occurrence of so rare a species in the Punjab.

HUGH WHISTLER, M.B.O.U.,
Indian Police.

AMBALLA CITY, PUNJAB,
29*th March* 1916.

No. XVIII.—OCCURRENCE OF THE WHITE-HEADED OR STIFF-TAIL DUCK (*ERISMATURA LEUCOCEPHALA*) IN THE KOHAT DISTRICT.

Four of these ducks were seen on the Dand Idal Khel Jheel on the 12th February, three of which were shot. The late Major Whitehead, in his list of Birds of Kohat and Kurram in the "Ibis" for April 1909, mentions this bird as having been seen on the same jheel in November 1906 and February 1907.

F. M. BAILEY, CAPT.

KOHAT, 26*th March* 1916.

No. XIX.—BRONZE-CAPPED TEAL (*EUNETTA FALCATA*) IN THE PUNJAB.

It may be of interest to record the fact that I shot a female Bronzed-capped Teal (*Eunetta falcata*) on a "jhil" near Bhagoke in the Zira Taksi of the Ferozepore District on the 27th November 1915. This is the first time I have seen this duck in this District. Other ducks, in the same morning's bag, were Mallard, Shoveller, Widgeon, Gadwall and Pochard.

H. W. WAITE,
Asstt. Supdt. of Police.

FEROZEPORE, 29*th Jan.* 1916.

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No. XX.—NOTES ON A FEW DUCKS IN THE DHARBHANGA DISTRICT, BEHAR.

The Goosander (*Merganser castor*) appears to have been more plentiful than usual this last cold weather. Three or four were obtained near here in the Keray River, all drakes and I have heard of several others being got in different parts of the district. A few Mallard (*A. boscas*) were also got here both drakes and ducks, all were put out of rushes. While staying with a friend of mine, Mr. H. E. Crowdy, a very keen naturalist and most observant man, we came across a large flock of Pintail (*D. acuta*) packed in a small jheel. They were literally like sardines in a tin, so closely were they packed. I fancy there must have been 500 or 1,000 probably nearer the latter number. The flocks consisted of both ducks and drakes. They were very wideawake and even though we stalked them with the aid of cattle we were not able to get close enough for a good shot and only dropped eight with our four barrels.

We also came across quite a large flock of Brahminies (*C. rutila*), about a hundred I should think, all feeding together on the dry paddy land.

We also fired at mixed flocks of the Indian Grey Lag Goose (*A. rubrirostris*) and Bar-headed geese (*A. indicus*) which were grazing in the dry paddy lands.

CHAS. M. INGLIS.

BAGHOWNIE FTY, LAHERIA SARAI,
2nd April 1916.

No. XXI.—UNUSUAL NESTING SITES.

I have frequently noticed the common Myna hopping in and out of old Squirrel's dreys and old Crow's nests during the breeding season, and once found an open Myna's nest with eggs in an old Crow's nest at Peshawar, it is not however so often that one finds Squirrel's dreys tenanted by species that usually breed in holes and so the two following cases may prove of interest.

When I was at Lyallpur (Punjab) at the end of January 1914, I noticed that an old Squirrel's nest on a small *Bombax* tree in the compound seemed to have a great attraction for a pair of Rose-ringed Paroquets (*P. torquatus*) and so I set a watch on the movements of the Parrots.

I noticed that the birds never left the tree for long and that one of them (presumably the hen) was constantly in the nest, where through a pair of glasses I could see her turning round and round in the way birds do when they are shaping a nest. I saw her thus occupied on several different days, and having eventually to leave the station I sent a man up the tree to fetch me the nest, in the centre of which I found as I had expected that a deep cup had been formed, in which I have no doubt that the birds would have laid their eggs had they not been disturbed. For the benefit of the uninitiated I would explain that Lyallpur is a comparatively new canal colony where the bungalows are mostly newly built and do not offer facilities in the way of holes for nesting sites (several Parrots prospected my bungalow for holes in vain) and where the trees mostly consist of plantations of young shisham, a hard wood remarkably devoid of holes and so birds that breed in holes must be hard put to it to find suitable nesting sites there.

The second instance of a bird which breeds in holes utilising a squirrel's nest as a nesting site occurred at new Dera Ghazi Khan, where I found on 7th February 1914 an egg of the Spotted Owlet (*A. brama*) deposited in a squirrel's nest on a small dead tree. The bird was sitting with its head

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just above the level of the nest, which was what first attracted my attention, and I had every opportunity of identifying it, otherwise I should have entertained considerable doubt regarding the ownership of the egg.

Here again the new station of Dera Ghazi Khan has been but recently built and the bungalows are all new while, as those who have been there know, there are scarcely any trees at all, except quite young ones newly planted.

The above are two good examples, I consider, of how environment may lead to a change in the most deep-rooted habits, for though it may be no unusual thing to find an owl breeding in an open nest, it is a decidedly uncommon occurrence in the case of the Parrot family.

A. J. CURRIE.

RANGOON, *Dec.* 1915.

No. XXII.—ADDITIONS TO THE "BIRDS OF KOHAT & KURRAM."

The late Major C. H. T. Whitehead had he lived would, I know, have communicated to the Journal a small list of additions to the Birds of Kohat and Kurram which on various occasions since the publication of that paper were observed or obtained by him and me. In order to make that paper more complete I may as well name the additions which, as far as I know, has not yet been done. The birds are as follows:—

Greenish Willow-warbler (*Acanthopneuste viridanus*).
Middendorff's Willow-warbler (*Acanthopnenste plumbeitarsus*).*
Blyth's Crowned Willow-warbler (*Acanthopneuste trochiloides*).*
The Rufous Shrike (*Lanius phœnicuroides*).
Grey-headed Flycatcher (*Culicicapa ceylonensis*).
Dark-grey Bushchat (*Oreicola ferrea*).
Pale Crag-Martin (*Ptyonoprogne obsoleta*).
Indian Plaintive Cuckoo (*Cacomantis passerinus*).
Long-eared Owl (*Asio otus*).
Collared Pigmy Owlet (*Glaucidium brodiei*).
Cinereous Vulture (*Vultur monachus*).
Honey Buzzard (*Pernis cristatus*).
Mute Swan (*Cygnus olor*).

The above make a total of 349 species for Kohat and Kurram.

H. A. F. MAGRATH, LT.-COL.

HANGU, 10*th January* 1916.

* Skins were sent to British Museum for identification, with what result I cannot say.

No. XXIII.—SOME BIRDS FOUND IN THE GURDASPUR DISTRICT, PUNJAB.

On the several occasions that I have been in the Gurdaspur District, I have been much struck by the dissimilarity between the avifauna of this sub-montane district and that of the Lahore district which borders it to the south-west and a description of some of the birds which are found as Gurdaspur and at Malikpur (in the Gurdaspur district) but which do not occur at Lahore may prove of interest, especially since the record includes several birds whose range so far to the north-west has not been

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mentioned in the *Fauna of British India*. One of the places frequently mentioned below is Kaisapur Jhil, that well known Mecca of Punjab sportsmen during the cold weather.

The Jhil which is about five miles from Gurdaspur is roughly from two to three miles in length and perhaps a mile across at the widest part and is thickly covered with aquatic vegetation, the tallest of which consists of a sort of cane which in places rises 12 feet above the water.

The other places mentioned, *viz.*, Malikpur, is approximately 20 miles from Gurdaspur and 5 from Pathankote, which is at the foot of the hills. Malikpur is on the tributary of a canal and the country round about is very well watered, the Gurdaspur district generally abounding in jhils. With this brief description of the localities, I will proceed to mention the birds found therein, the numbers and nomenclature followed being those given in the *Fauna of British India*.

4. The Jungle Crow (*Corvus macrorhynchus*).

I found a nest of this species in the course of construction at Gurdaspur in March. At Malikpur where I noticed the Koel and where this Crow is the only corvine species, the Koel must victimise it and not *Corvus splendens* as it usually does elsewhere. In the *Fauna* it is stated that this Crow occurs in every portion of the Empire, but it certainly does not occur at Lahore, nor have I seen it anywhere west of Gurdaspur, Ambala and Karnal, in the Punjab, nor any where in the North-West Frontier Provinces. This only applies to the plains as it is common in the hills. Whitehead however records it as a cold weather visitor to Kohat.

104. The Striated Babbler (*Argya earlii*).

I was very surprised to find this bird on the middle of Kaisapur Jhil and displaying decided aquatic habits by building its nest suspended between reeds about 2 feet above the level of the water, for all the world like an enormous Reed-Warbler's nest. I found nests of this description containing eggs on 13th and 15th August 1914 and shot the bird in one case for identification.

The nearest locality to the Punjab where this bird is found is according to the *Fauna* Sind and Saharunpur, so the present instance forms an extension of its range. I cannot recall having met with this bird elsewhere in the Punjab though Col. Magrath has observed it at Bannu, in the North-West Province.

243. The Common Iora (*Ægithina tiphia*).

I have met with this species at Hoshiapur in March and Gurdaspur in August, while at Malikpur I found a nest with three young in a small thorny tree on the bank of the canal on 1st August 1914. A peculiarity in the Punjab birds of this species that I have so far seen is that the cock birds do not appear to assume the black upper plumage in the hot weather, which led, I regret to say, to my shooting the cock bird in the case of the above-mentioned nest, as I had no idea that he could be breeding.

However when I visited the nest a week later all the young birds were doing well.

This is a considerable extension in the range of this species as in the *Fauna* it is stated as not occurring west of a line drawn from the Gulf of Cambay through Abu to Dehra-Dun.

348. The Wall-Creeper (*Tichodroma muraria*).

I have only come across this species on one occasion at Gurdaspur in December, when it was climbing over the cemented boulders, which formed the side of the canal.

363. The Indian Great Reed-Warbler (*Acrocephalus stentoreus*).

This bird breeds in large numbers on Kaisapur Jhil. Between the 9th and 18th August I found 15 nests, all built in the reeds from 2 to 5 feet

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above the water, the majority of which contained eggs rather hard set, two nests containing young. Four eggs is the normal clutch and the nests appeared to be grouped together, 4 or 5 pairs building in close proximity. This bird migrates through Lahore in April and May and again in October.

The eggs of this bird are very variable in shape, size and markings, some being large and oval, others smaller and obtuse, and the character of the markings vary from speckling to blotching. The *Fauna* records that the only place in the plains where this bird has been found breeding is Sind.

377. The Moustached Sedge-Warbler (*Lusciniola melanopogon*).

I saw large numbers of this species on Kaisapur Jhil between the 9th and 19th August, but whether they were on migration or are resident I cannot say with certainty.

I however came across several nests from which the young had flown, which struck me as being too small for nests of the Indian Great Reed-Warbler and which were situated just above the level of the water, which denoted that they had been built earlier in the season, in May or June before the monsoon sets in when the level of the Jhil rises considerably.

It is therefore just possible that these birds breed there. The two specimens I shot for identification were moulting though I saw several birds in very fine plumage.

382. Franklin's Wren-Warbler (*Franklinia gracilis*).

I found two nests of this species at Malikpur on the 1st and the 6th August 1915, each containing two eggs, and exactly resembling a tailor birds in structure. I have not come across this species anywhere in the Punjab or North-West Frontier Province outside the Gurdaspur and Kangra Districts.

463. The Yellow-bellied Wren-Warbler (*Prinia flaviventris*).

A common species on Kaisapur Jhil in August. This is the only locality in the Punjab in which I have met with this species, but this may be because I have not been in other likely places in the hot weather.

465. The Jungle Wren-Warbler (*Prinia sylvatica*).

Plentiful at Malikpur where I found three nests, one of which had 4 eggs, on 6th August 1914. I have not observed this species elsewhere in the Punjab and the above would appear to be an extension of range for the species, whose western limit according to the *Fauna*, appears to be a line drawn from Cutch to Garhwal.

544. The Black-headed Myna (*Temenuchus pagodarum*).

Breeds at Gurdaspur. Except for a single straggler at Lahore, I have only come across this species in the *plains* of the Punjab at Gurdaspur, Hoshiarpur, Ambala and Karnal.

In the *Fauna* its range is given as the whole of India proper as far east as the longitude of Calcutta but it is certainly absent from the major portion of the Punjab and North-West Frontier Province so far as the plains go.

558. The Sooty Flycatcher (*Hemichelidon sibirica*).

On 31st July 1914 I observed a solitary individual at Malikpur which disappeared the next day. I have also seen it in the Kangra Valley in September.

723. The Striated Weaver-bird (*Ploceus manyar*).

I found nests with eggs on Kaisapur Jhil on 11th and 18th August 1914. The nests were suspended from bull-rushes growing in water a long distance from terra firma. Here again the *Fauna* gives the distribution of this species as the whole of India proper but so far as the Punjab is concerned I have not met with it outside the Gurdaspur district, and if it should occur elsewhere in the Punjab I fancy it is confined to the immediate neighbourhood of Jhils.

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727. Hodgson's Munia (*Uroloncha acuticauda*).

I saw a pair of Munias which I am nearly certain belongs to this species (though I did not shoot one) feeding in a field at Malikpur on 8th August 1914. I have not come across this bird elsewhere in the Punjab and this would appear to be an extension of its range.

813. The Swallow (*Hirundo rustica*).

Early in August at Malikpur I observed three young birds sitting on a telegraph wire, being fed by their parents, from which I presume that this species breeds there, as I think the birds were too young to have flown far and I have found it breeding at other places in the plains, *viz.*, Peshawar. From what I could observe through glasses the birds appeared to be intermediate between *H. rustica* and *H. gutturalis* rather than pure *H. rustica*.

838. Hodgson's Yellow-headed Wagtail (*Motacilla citreoloides*).

I saw large numbers of this species, including a large proportion of young birds on Kaisapur Jhil in the beginning of August. The birds were evidently passing through on migration as the Jhil would be swarming with them on one day and there would be very few the next. The two specimens I shot were young birds and could not be distinguished with certainty from *M. citreola* which is a migrant to Lahore, but the very black upper plumage of the majority of the birds I saw flying about makes it pretty certain that they belonged to the present species and not to *M. citreola*.

1012. The Blue-throated Barbet (*Cyanops asiatica*).

Found a nest which contained young in a mango tree at Malikpur on 5th August 1914. This is the only place in the plains of the Punjab where I have observed this species.

1090. Franklin's Nightjar (*Caprimulgus monticola*).

At Malikpur early in August I flushed a smallish brown coloured nightjar which rose with a chuckle and which I believe is referable to this species. This is also I think the nightjar which I have observed in the lower Himalayas at Abbottabad in June, on the road to Murree and at Mirpur in the Kangra Valley in September and at Gurdaspur in August.

1129. The Sirkeer Cuckoo (*Taccocua leschenaulti*).

I found a nest containing four eggs of this species at Malikpur on 7th August 1914.

The nest was lined with green leaves and was situated in the thick growth at the end of a branch of a mulberry tree and was well concealed.

The *Fauna* states that this bird is rare in the Punjab and this is the only occasion on which I have met with it.

1307. The Spotted Dove (*Turtur suratensis*).

I found a nest with one young one and others in the course of construction on 4th August 1914 at Malikpur. As far as I am aware this bird does not breed elsewhere in the Punjab plains and at Lahore is a migrant passing through in July, August, September and again in April.

1398. The Ruddy Crake (*Amaurornis fuscus*).

On Kaisapur Jhil in August I came upon a small brown Crake with a good deal of rufous about it which I think was this species. I got a good view of the bird for a quarter of a minute at a distance of only 5 yards, but before I could raise my gun it was off.

1402. The Moorhen (*Gallinula chloropus*).

I saw this species on Kaisapur Jhil and found a typical Moorhen's nest which was empty on 16th August 1914.

1404. The Purple Moorhen (*Porphyrio poliocephalus*).

This species is very numerous on Kaisapur Jhil where it is resident. I found nests with eggs on 18th August 1914. I have not observed it elsewhere in the Punjab.

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1405. The Coot (*Fulica atra*).

This is the commonest bird on Kaisapur Jhil during the cold weather, but it does not apparently remain to breed and there was not a bird to be seen when I was there in August.

1418. The Stone-Curlew (*Œdicnemus scolopax*).

I once killed a bird of this species with one of my Peregrines at Gurdaspur in December. I also think I saw this bird at Malikpur in August but could not get close enough to it to be certain.

I have not seen this bird elsewhere in the Punjab.

1429. The Pheasant-tailed Jacana (*Hydrophasianus chirurgus*).

This bird breeds plentifully on Kaisapur Jhil and I found many nests during the first half of August. I have not observed it there in the cold weather.

1554. The Eastern Purple Heron (*Ardea manillensis*).

Breeds plentifully on Kaisapur Jhil making its nest among the tallest and thickest cane brake. Found several nests with young and eggs during the first half of August.

1571. The Yellow Bittern (*Ardetta sinensis*).

Fairly common on Kaisapur Jhil where it breeds, making its nest 3 or 4 feet above the water in the reeds. I found nests on the 9th, 11th and 18th August 1914, all of which contained very hard set eggs or young. The *Fauna* states that it is rare in the most parts of India and only recorded from a few localities. I have not seen it elsewhere in the Punjab. This species can always be distinguished from the next (the Chestnut Bittern) by its paler colour and by the black on the wings which is very conspicuous during flight.

1572. The Chestnut Bittern (*Ardetta cinnamomea*).

I came across one solitary individual on Kaisapur Jhil on 15th August 1914 and should say that it is decidedly rare in the Punjab where the Fauna does not record it as being found. Its bright chestnut colour makes it a conspicuous object on the wing.

1591. The Cotton Teal (*Nettopus coromandelianus*).

I saw several parties of this Teal in twos and threes on Kaisapur Jhil in the beginning of August and shot one for identification.

The boatmen informed me that this Teal does not breed on the Jhil and only passes through on migration, but this is a point which requires confirmation.

In favour of the migration theory is the fact that I also saw flocks of Garganey Teal and Pochard which had evidently just arrived on migration and have never noticed this Teal here during the cold weather.

On the other hand it is somewhat significant that the birds seen were some of them in pairs and the migration theory would require in support of it evidence to show that this bird bred further north or in Kashmir, which so far as I am aware has not been established. The *Faund* states that this bird is wanting in the western Punjab and I have not observed it when out shooting round Lahore.

A. J. CURRIE.

RANGOON,
December 1915.

No. XXIV.—NOTES ON SOME BIRDS FROM IMPHAL, MANIPUR STATE.

Five Common or Grey Quail (*Coturnix communis*) have been shot up here this year, also for the first time in the six years I have been up here. Other rare birds shot this year have been one Baikal Teal (*Nettium formosum*),

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three Eastern White-eyed Pochard (*Nyroca baeri*) and one Bronze-capped Teal (*Eunetta falcata*). In my six years' residence here one Baikal Teal, two Eastern White-eyes and one Bronze-capped Teal have been shot previously, and one of the last named has been netted and placed in a tealery.

J. C. HIGGINS, I.C.S.

IMPHAL, MANIPUR STATE, ASSAM,

20th January 1916.

No. XXV.—WHAT IS THE LARGEST SPAN OF A BIRD?

Can any of your readers tell me what is the largest recorded span of a bird?

Newton in his "Dictionary of Birds" if my memory serves me right, dismisses as exaggerations statements that albatrosses sometimes have a span of over 20 feet. Their usual span is 10 or 11 feet. Ives, in "A voyage from England to India in the year 1754", p. 5, states that "An albatrose (sic), a sea fowl, was shot off the Cape of Good Hope, which measured 17½ feet from wing to wing."

Mr. T. J. Spooner, District Engineer, M. and S. M. Railway, tells me that he once shot an adjutant bird having a span that he estimates at 18 feet. He saw the bird standing near some quarries about a mile and a half from Wardhan and noticed that it had a large pouch hanging down from its neck. After shooting it he laid it across the railway embankment near, and found that when stretched across this embankment its wing tips stretched out over the edge by about a foot on each side. The embankment was of a narrow gauge single line and has a prescribed width of 16 feet. I understand there was a possibility of the embankment having worn away a little but that the official in charge would have been liable to a fine if the width decreased to 14 feet.

The usual span of the adjutant is between 9 and 10 feet. I once had in captivity an adjutant of a span of nearly 11 feet.

The pelican is stated to have a span reaching to 15 feet.

I think that if any one shoots a bird of over 15 feet span he would be well advised to send it to a museum as otherwise his statement as to its size would be liable to be met with a certain degree of scepticism.

Another question on which I should like to have some information is as to what is the greatest height at which birds are able to fly?

Knowlton in "Birds of the World" states that the condor usually soars at heights between 9,000 and 15,000 feet. I have observed the black vulture soaring at a height of about 11,000 feet above sea level in Naini Tal. In Agra soaring birds rarely are visible at so great a height as 6,500 feet.

The above questions are of interest for the following reason. Of the fossil flying reptiles known as "pterodactyls" the largest reached a span of about 21 feet. It has recently been stated in a semi-popular scientific magazine that the atmosphere of the present day is too tenuous to support flying animals of such large size, and that therefore in cretaceous times when these reptiles were alive, the atmospheric pressure must have been much greater than it is nowadays. This theory appears to me to be quite unwarranted for various reasons. The measurements above given show that there is no such wide difference between the span of existing birds and the span of the "pterodactyls" as was supposed by the author of the theory. At the height

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of 2 miles above sea level where I have seen the black vulture soaring, the barometer would normally stand at a height of about 20 inches. That is to say present day birds could and can fly at a much less barometric pressure than exists at the surface of the earth.

I published a note on this subject in the Aeronautical Journal for October 1914, p. 324, but should be glad to have further information on the points here raised.

E. H. HANKIN.

AGRA, U. P.,
21*st December* 1915.

No. XXVI.—ABUNDANCE OF THE SAW SCALED VIPER (*ECHIS CARINATA*) IN THE PUNJAB.

This year in Gujranwala District, Punjab, we waged a special war against the *Echis* Viper which is there most abundant and destructive to human life. Two annas per head were sanctioned as a reward, and although the matter was neglected away from Head-quarters, the fact, that there I took it into my own hands and paid the money without delay on the production of the snakes, encouraged a party of Gugras to earn their living by catching snakes round about Gujranwala itself.

These snakes were brought in to me almost daily, in any number up to five hundred at a time. They were brought in alive, twenty or so in an earthern pot closed by a piece of cloth tied over the mouth; as soon as the order to kill the snakes was given the cloths were taken off the pots, and the snakes were extracted one at a time with a pair of rough tongs, and thrown on the ground to be despatched with a stick. As an additional precaution against the snakes being used a second time to claim the reward, I had all heads cut off after the corpses had been laid out in rows and counted.

A few other snakes were included in the following figures, but all but one or two per cent. were *Echis* Vipers. My returns shew the following monthly totals:—

July	927.
August	2,455.
September	2,902.
October	997.

A few snakes were still being brought in at the beginning of November, but the reward was stopped owing to lack of funds.

The snakes apparently only emerged in July as none were brought in before then. Both adults and young ones were brought in about equal numbers, but I do not think that there was any question of the snakes being bred especially for the reward. From all accounts the species is sufficiently numerous near Gujranwala on a certain type of ground for that device to be unnecessary.

HUGH WHISTLER,
Indian Police.

AMBALA CITY, 15*th November* 1915.

No. XXVII.—FOOD OF THE *CARABIDÆ*.

Maxwell Lefroy, in his "*Indian Insect Life*," remarks that details of the food of the *Carabidæ* (predaceous ground beetles) are much wanted. In this connection the following account may prove interesting.

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While walking in the compound this morning I noticed at my feet a mass of foam round which a black and yellow ground beetle was moving. Closer inspection showed that the beetle was *Eudema augulatum* and that the foam enclosed a young snail, *Anophanta bistrialis*, which is quite common locally.

The beetle was on the ground and was attacking the snail which had climbed up a small twig. The carabid was very determined in its onslaught, rising and biting the snail which defended itself by producing a large amount of frothy mucus. When *Eudema* approached *Anophanta* its waving antennæ invariably touched the exposed head of the snail, which was at once very quickly withdrawn. At every assault the beetle fiercely forced its head down through the frothy mass and bit at the snail, usually at its retracted head.

Every now and then, evidently annoyed by the mucus, the carabid came to the ground and rubbed the sticky stuff from its mouth parts, head, body and legs. Meantime the snail had again protracted its head and was endeavouring to see how it could escape from its relentless foe. Once the beetle managed to get a good bite into its victim's back just behind the head. I saw it tear off the flesh and carry the piece in its mandibles down to the ground where it was eaten.

All the while the snail was busy making its protective covering of froth. The mucus seemed to be that ordinarily secreted but it covered the pulmonary opening, the air expelled from which made the bubbles which rendered the whole mass frothy.

At length realising that the snail had no chance against such a determined and active enemy I took it up, washed it and found that with the exception of the wounds on the back and on the foot, it was not otherwise harmed.

Dr. Sharp, in his account of the *Carabidæ* in the Cambridge Natural History, records the fact that species of *Caralus* found in North Africa, where snails abound, are specially formed for attacking these molluscs, having the head long and slender so that it can be thrust into the shell of the snail.

It is perhaps worth noting that here in South India *Eudema* has the same food as its African relatives.

W. RAE SHERRIFFS,

Prof. of Biology, Madras Christian College.

MADRAS, *8th January* 1916.

No. XXVIII.—BIOLOGICAL NOTE ON *ARGYNNIS HYPERBIUS*.

Mr. T. C. F. Fryer's note on *A. castetsi* led me to work out the life history of *A. hyperbius* as found in the Nilgiris. Plenty of ovæ but no larvæ were obtained both at Coonoor and at Ooty; I think that it was too early for the larvæ. Males of this butterfly keep to the summit and ridings of the hills, the females, scarce in these situations, are very plentiful in the sholas in the valleys probably because there only is their food-plant to be found. By watching several females I was able to obtain plenty of eggs, these being invariably deposited on objects such as dried grasses or bracken in the neighbourhood of the food-plant.

Ovum.—Broadly conical, apex blunted, surface morulaform, colour straw yellow.

First instar.—Head shiny black, body greenish with a white middorsal stripe, each segment bears a row of papillæ from which spring stiff setæ,

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the anterior setæ curve strongly forward over the head and those on the posterior segments curve sharply back.

Second instar.—Head black, body greyish brown, dorsal white stripe still present. Setæ now replaced by stiff branching spines. The thoracic segments bear a pair of these on either side and a single, minute, subspiracular one. The subdorsal row are alternately black and yellow beginning with a black one on the first abdominal segment. The supraspiracular row are all black whilst the supspiracular row are all yellow.

Third instar.—Much the same as the last only that the ground colouring is now black and the yellow spines are now orange red.

Fourth instar.—Differs from the last in that the mid-dorsal stripe has become rust-red as also are the spines which first were yellowish.

Fifth instar.—Compares fairly closely with Mr. T. C. F. Fryer's description of the Ceylon form.

Head.—Black, vertex deeply notched, covered sparcely with stiff hairs.

Body.—Velvety black, a mid-dorsal stripe rich brick-red. Each segment bears three spines on either side forming subdorsal, supraspiracular and subspiracular rows. The subspiracular spines on the thoracic segments are minute and inconspicuous. The subdorsal spines on the first thoracic segment slope forward and appear to spring from the vertex of head unless viewed under a powerful microscope. The subdorsal row are all bright red except those on the first abdominal and thoracic segments. The supraspiracular row are all black. The subspiracular row are all red, those on the thoracic segments being tipped with black.

Pupa.—Closely resembles the *Vanessidæ*. Cylindrical, thorax domed, head bifid, a subdorsal row of short spines on either side the mid-dorsal line, abdominal segments arched. Colour sooty grey with a fine network of black lines over all the surface conforming to no particular pattern. The spines on the thoracic and first two abdominal segments brilliant gold. Suspended by the anal segment.

Duration of life history averaged from six weeks to two months, the season however was particularly cold and may have appreciably prolonged it.

F. C. FRASER, CAPTAIN, I.M.S., F.E.S.

COONOOR, *March* 1916.

No. XXIX.—THE PUPA OF *SPALGIS EPIUS* (WESTWOOD).

(*With a text figure*).

The accompanying photographs of a pupa of *Spalgis epius* (Westwood) will I believe be of interest to the readers of the Journal. A drawing of it has already appeared in Volume VIII of the Journal along with an article by the late Mr. E. H. Aitken. But Mr. Maxwell Lefroy in his *Insect Life* (page 426) cautions the reader against taking Mr. Aitken's remarks as to the resemblance of the pupa too seriously and thereby questions the accuracy of the drawing. The photographs sent herewith should set at rest all doubt on the point. The resemblance to the face of an ape is unmistakable. The head and prothorax represent the muzzle and the line between the mouth. The wings stand for the cheeks. The 'malignant gleam' of the eyes is much more evident than in Mr. Aitken's drawing. A number of minor details have been omitted in the latter, but their omission does not effect the resemblance of the pupa which certainly recalls the features of simian physiognamy.

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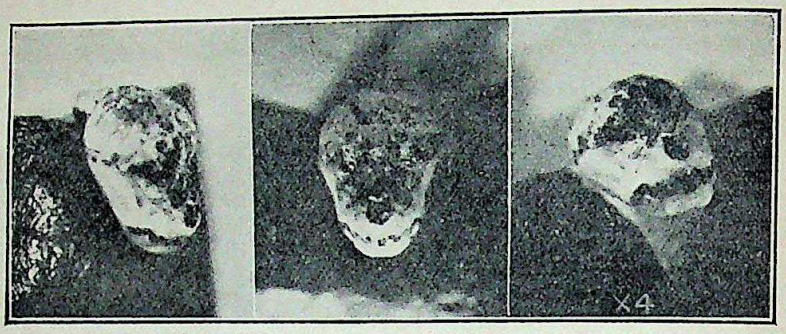

Mr. Lefroy's caution may therefore seem uncalled for. But he says he has reared the butterfly himself at Pusa. It seems possible therefore that the resemblance of the pupæ he obtained and which he could not fail to have studied was defective or remote. Those that I have observed here, do not all show the resemblance to an equal degree. The black in the eyes is not always conspicuous and the dark patch which stands for the nostrils does not often show up. Similar deviations are observed in the butterflies also. In the male the white spot on the forewings is seldom quadrilateral and the more diffuse white in the wings of the female is certainly not so diffuse as figured in Lefroy's book. These variations are in specimens reared from (be it noted) the egg mosses of a species of *Pulvinaria* on sandal. Lefroy's were from apparently the adults of *Phenacoccus iceryoides* and the species of mealy bug from which Mr. Aitken obtained his specimens is not known. It is possible that specimens which vary so much even when reared from the same host are likely to vary a great deal more when they are from different hosts. In any case that some pupæ are so marked as to recall the face of an ape is I believe established by the photographs and I am glad to be able to record that so far as Mr. Aitken's note on *Spalgis epius* is concerned there has been no lapse in the usual accuracy and truth of his observations.

K. KUNHI KUNNAN, M.A.,
Senior Assistant Entomologist.

BANGALORE,
29*th March* 1916.

No. XXX.—A LONGICORN BEETLE (*CERAMBYCID*) FEEDING ON ORANGE TREES.

This longicorn beetle, scientifically known as *Stromatium barbatum*, Fabr., is recorded to have been found widely throughout India, in as divergent localities as Assam, North-West India, Central Provinces, Ceylon, Burma, Andamans, and outside of India, in Mauritius, Bourbon, Madagascar, etc. This is known to infest various forest trees among which Teak, *Acacia catechu*, *Dendrocalamus strictus* and Mango are important. This beetle was reported in 1901 from Raipur Range as infesting bamboos and considerable damage was attributed to it. Mr. Lefroy found this insect infesting mango trees at Pusa. In the Central Provinces in addition to bamboos it is found to be a very common insect pest of the orange, a fact which has not been

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recorded previously. Another orange cerambycid beetle, *Chloridolum alcmene*, Thoms, is recorded from Coorg and Assam but, from an examination of specimens reared in the laboratory at Nagpur, it appears that *Stromatium barbatum*, Fabr., is a common beetle in the Central Provinces.

These insects live principally in the dead wood of trees making galleries and as they proceed, tunnelling, the hind portions of the galleries become tightly packed with wood dust and excreta. The larvæ usually pupate in the galleries near the outer bark, which is found to be bored with oval holes when the beetles have emerged. There is only one record, noted by Stebbing, of a green tree being infested by this insect, *i.e.*, in the Kulsi Teak plantation in Assam; the present writer has however recently extracted a larva (believed to be that of *Stromatium* but not bred) from a green branch of an orange tree. This larva was found in a hole, which had been bored by the caterpillar borer of the orange trees, *viz.*, *Arbela*.

The most interesting feature of the adult beetle is that in the male, the side of the prothorax has a patch of silky brownish hairs.

The beetles emerge in June and July and after mating begins to deposit eggs during a period of from a week to a fortnight, after which both the males and females die. The eggs are invariably deposited, not openly on the bark of the tree, but always in the cracks. These cracks may be caused either by splitting up the bark or through some injuries to the stem. The females after mating may be seen sitting near such crevices as afford a natural and safe place of egg deposition or the female thrusts in the eggs in small pits, etc.

The eggs are white in colour, pointed at one end and blunt at the other; measure 2·5 m/m. in length and 1 m/m. in breadth, in shape oval, broader in the middle, and a little flattened at the sides with the blunt end exposed whenever the eggs are deposited in pits or cracks on the bark. They turn greyish before hatching, which takes place, not by any regular splitting of the egg shell, but the larva comes out at any place. Hatching of the eggs is not regular but may go on for a long time. In the laboratory some eggs hatched very soon after being deposited, while some remained over three months. A small whitish grub about 2 m/m. long and 5 m/m. broad hatches out and very soon begins to bore into the wood. The brown mandibles, though short are very powerful. Since the whole larval development of the insect is practically confined to the wood, observations on moulting, etc., can hardly be made correctly.

The full-grown larva is 25-30 m/m. long, stout, whitish, with a brownish patch on the prothorax, mouth-parts deep brown, mandibles black. The prothorax is much swollen and wrinkled, the head retractile in the fleshy prothorax. The grubs eat out winding tunnels, which are blocked with saw dust and excreta. When full-fed they pupate in a short length of tunnel, which curves to a certain extent. The work of these larvæ, as also of the mature beetles as they gnaw through the wood, can often be heard and on the stem several holes are bored on the exterior, showing the places from which the beetles have emerged.

As regards the duration of a life cycle of this beetle little can be said definitely. In one instance a tree was kept under observation. It was cut up leaving a stump 3 ft. long above the ground. For some time the tree sprouted well but afterwards died. After eighteen months the stem was removed from the ground and brought to the Laboratory. The attack of this beetle was ascertained from the holes or tunnels which reached as far as the cut end. Within a space of 6 months time, during May and June beetles began to emerge and so much so that about 20 beetles emerged from a 3-ft. stem. The stem was then split open, but a few larvæ in different stages of development were still found in the tunnels.

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In another instance a piece of dead wood of an orange tree containing several larvæ of *Stromatium barbatum*, Fabr., was kept under observation in the laboratory in January 1912. Till April 1914 no beetle was found to have emerged, but in July of the same year a few beetles emerged. The piece of wood was then split up to see whether it contained any more larvæ. To the writer's surprise the piece was found to contain several grubs measuring from 7 m/m to 35 m/m. Thus the life history of the beetle does not occupy a fixed period but ranges over a wide limit of time, the shortest may be said to occupy between a year and a half to two years.

A very common but dangerous practice, invariably observed in gardens, is the leaving of dried branches, old rotten trees, fallen fruits, without attending to regular removal and this is a practice which is always dangerous since all those afford breeding places to many noxious insects. Therefore it is almost imperative to remove and burn the affected parts of plants, rotten trunks, branches and fruits fallen on ground.

In the case of this longicorn beetle it has been observed that orange trees of very long standing (say 15 to 20 years) are affected, and when once the attack begins it is not possible to extract the grubs from the galleries by thrusting stiff wire as is often suggested, because the tunnels are tightly filled with excrement, nor is it possible to inject any poisonous liquid like Carbon-bisulphide or phenyle. The only course left in such cases is to remove the old and affected trees and plant new ones or to paint a mixture of bees-wax, resin and linseed oil over the wounds and cracks, etc., in the dead parts of the plant and more specially the lower part of the trunk.

J. L. KHARE,
Lecturer in Entomology.

NAGPUR AGRICULTURAL COLLEGE,
6th April 1916.

No. XXXI.—THE CALOTROPIS FLY.

(*With a text figure.*)

I believe very little is known of this fly in India. During the months of May, June and July when this Indian milk weed (*Calotropis gigantea*) is in fruit it is infested with the maggots of this fly. While engaged in hairy-caterpillar work in Yagati, Kadur District, Mysore State, my attention was drawn to this interesting fly and I was able to make some observations on its habits and life history. The life history so far as I have been able to follow is as below:—

Oviposition.—This is a very tedious process occupying as it does, not less than 30 to 40 minutes for a female to lay a cluster of 8 to 12 eggs. The *Calotropis* fruit is a tough one with a thick rind. The ovipositor of the fly has to pierce from 8 to 12 m.m. to reach the smooth endocarp where the eggs are laid just touching the soft ovary. The fly gets caught in the fruit by the milky juice exuding from the wound while ovipositing and it now submits itself tamely to any treatment or examination. When the ovipositor is extricated from the fruit after egg laying, it takes fully 10 minutes for the fly to free itself from the gummy juice of the fruit adhering to the ovipositor. Oviposition is mostly observed at dusk or in the cool early hours of the morning.

The Egg.—The eggs are generally dull, creamy white in colour and they resemble the fleshy outgrowth of the carpels of very immature citrus fruits. The eggs are laid in clusters of 8 to 12 in the smooth endocarp of the fruit, touching the soft ovary. The maximum number of eggs found in one big fruit was 30 in three different places. The egg state lasts from 4 to 5 days. The egg measures 1·5 m.m. in length.

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Calotrophis Fly Egg Clusters.

The Larva.—The larvæ hatch out from 4 to 5 days from oviposition. They are generally cylindrical with one end pointed and the other blunt; the fully grown maggots are of a pale yellow colour and measure from 8 to 10 m.m. in length. The jumping habit which is a special feature of all fruit fly maggots is well developed in these. On hatching from the eggs the maggots bore into the soft ovary and after this is completely eaten up, the mesocarp is attacked. The larval life lasts from 12 to 15 days. When full grown the maggots cut a hole through the epicarp and drop to the soil and pupate there at a depth of $\frac{3}{4}''$ to $1''$. A thin parchmenteous endocarp a net work of fibrous mesocarp, and a small pellet of excreta mixed up with portions of ovary are the remnants of the fruit adhering to the plant when the maggots leave the fruit for pupating.

The Pupa.—The pupæ are generally whitish at first and gradually turn from light brown to dark brown as the period of emergence of the fly approaches. The pupæ are from 4·5 to 5 m.m. in length and 2·5 to 3 m.m. in thickness and the pupation period lasts from 11 to 12 days.

The Adult.—Length $6\frac{1}{2}$ to 7 m.m. Wing expanse 15 m.m. From the characteristic colouring and wing markings, the flies can very easily be made out as a Trypetid. I found this fly named *Leptoxyda longistylus*, Wied, in

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the Entomological collection of the Coimbatore Agricultural College and I do not find any reference made about this fly in any Indian publication except in Mr. Fletcher's *South Indian Insects* and Mr. Lefroy's *Indian Insect Pests* where only a passing reference is made.

Under the name *Dacus longistylus*, Wied, Mr. Froggatt, the Australian Entomologist, records a fruit fly in his report on fruit flies and other injurious insects he noted in different countries of the world he visited. page 94 (Pub. 1909 by the Department of Agriculture, New South Wales). Comparing the *Calotropis* fly with his description in that publication, I think the subject of this paper may be the same. Mr. Froggatt gives the habitat of this fly as Egypt, evidently the presence of this fly has not been recorded in any publication although I think it may have a wide distribution in S. India. It is very widely distributed in Mysore State.

Life Cycle.—The life of the egg is 4 to 5 days, the larvæ 12 to 15 days and the pupæ 11 to 12 days and thus the whole period from the egg to the adult is 27 days to a month. There are two broods beginning from the middle of May to the middle of July and by the 2nd week in August the larvæ from the 2nd brood pupate in the soil and no fruits are found on the plants for another 3 months.

Natural Enemies.—A 'Braconid' parasite of the maggots is observed to move over the rotten *Calotropis* fruits containing maggots, feeling with the antennæ different portions of the surface and inserting the ovipositor, which is long, into the fruit in the place where the maggots are close to the parchmenteous endocarp. This latter place is more or less in an advanced stage of the maggots.

Conclusion.—Considering that very little is known of the various species of fruit flies and their host plants in India, I venture to think that the above notes on the *Calotropis* trypetid may contribute a little to our knowledge of this very little known but none the less economically important family of flies.

(*Bulletin of Entomological Research, September* 1915.)

ETHIOPIAN FRUIT FLIES OF THE GENUS 'DACUS' BY PROF. BEZZI.

"The attempt to divide the Ethiopian species into the two genera *Dacus* (S. str.) and *Leptoxyda* seems to be at present not satisfactory, although accepted by Hendel in his recent synopsis of the genera of the Trypaneids (Wein. Entom. Zeitung, XXXIII, 1914, page 74). It is indeed very difficult to find a dividing line between the species with free and those with fixed abdominal segments, and between the species with a flattened ovipositor and those in which it is cylindrical. Therefore I have not adopted this division in the present paper. On the other hand, I have found a better character for dividing the Ethiopian species in the thoracic chætotaxy. Some species, which are usually of larger size, have three supra-alar bristles, the anterior one being developed like the others; I propose to call this group *Tridacus*, subgen. n. The remaining species are smaller, have no anterior supra-alar bristle; and as they contain *D. Oleæ*, I will reserve for these, the name *Dacus* (S. str.) With this latter group the genus *Leptoxyda* must be considered synonymous, unless it be regarded as distinct, with the single typical species *longistylus*."

T. V. SUBRAMANIAM,
Junior Assistant Entomologist,
Department of Agriculture.

BANGALORE,
22nd *January* 1916.

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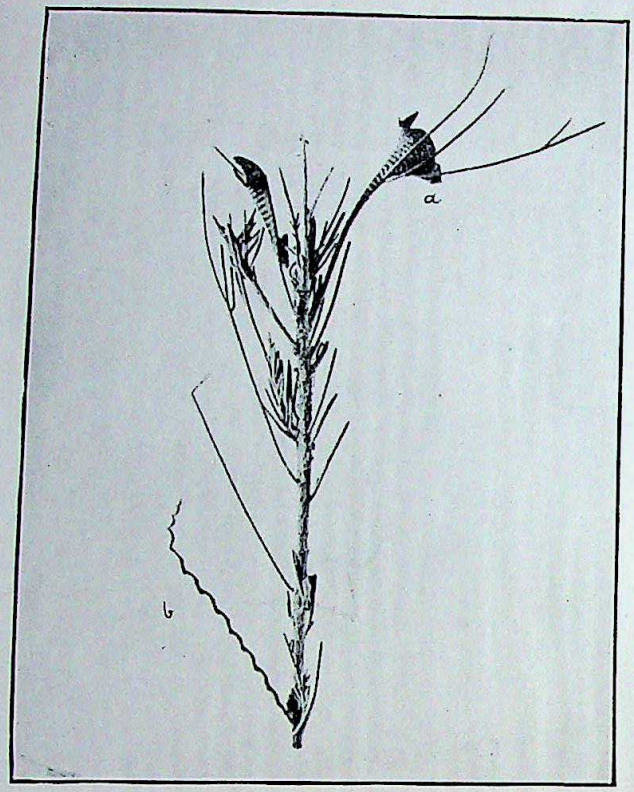

FIG. I.

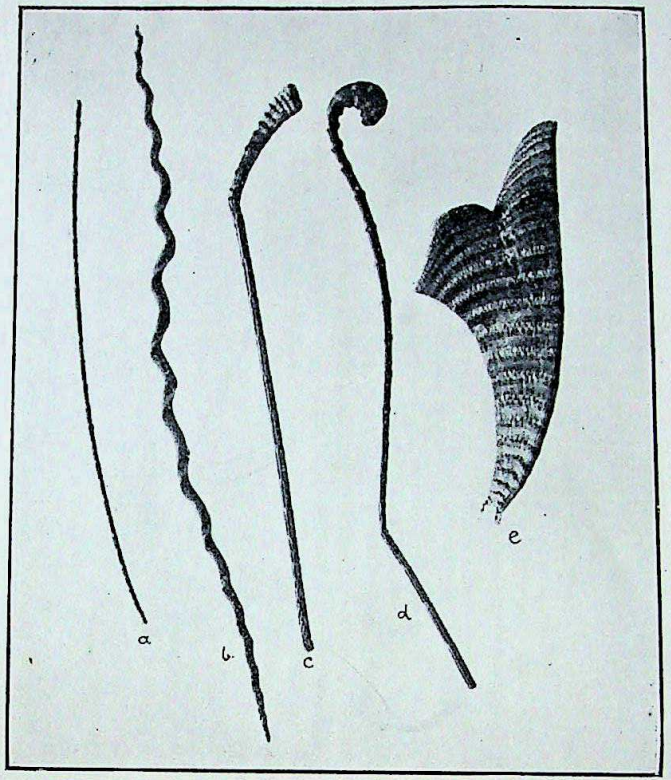

FIG. II.

MALFORMATIONS IN CASUARINA.

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No. XXXII.—SOME DISEASES ON TREES IN MYSORE CAUSED BY A SPECIES OF *PHYTOPHTHORA*.

A Preliminary Note.

While investigating the disease on the areca-nut caused by *Phytophthora*, under Dr. Leslie C. Coleman, I have come across (1) a disease of figs (*Ficus carica*) causing a soft rot, and (2) a disease on citron (*Citrus medica*), Vern. Can. Madala-Hannu and (3) Canker in the cortex of the Para rubber (*Hevea brasiliensis*). The first of these was met with in Bangalore. The second in the Bababudans and the last in the coffee areas of Koppa. The third one seems to be similar to the fungus on the fruits of Cacao and Rubber but the other two are apparently new to science. For the first one I propose provisionally the name *Phytophthora fici* and for the second *Phytophthora citri*. It is interesting to note that cospores are found sunken in the outer tissues of the citron fruit. A comparative study of all these forms is being made in this Department when the question of nomenclature will be definitely settled.

M. K. VENKATA RAU,
Senior Assistant Mycologist.

Mysore Agricultural Department,
Bangalore, 9*th November* 1915.

No. XXXIII.—MALFORMATIONS IN *CASUARINA*.

(*With a Plate.*)

These malformations were observed in Casuarina trees growing in "nullahs" in Bangalore. The "nullahs" are deep waterways often 30 feet deep, formed by the corrosive action of water, which runs in the form of a small stream during the rainy season but is dry during summer. The Casuarina, which very often grows on the steep sides presenting a stunted and gnarled appearance, rarely attains a height of more than 10 feet, but its root system is very extensive and deep feeding, reaching down to the soft earth below.

On close examination of the twigs are found long strap-shaped bodies, broader at the top than at the base which often curl up in a fantastic manner. These fasciated structures begin to develop in fairly large numbers after the monsoon showers of June but many of them wither away during the dry weather. The buds in the axils of a few develop and give rise later to the normal shoots of Casuarina (Pl. Fig. I., a). This fact is in accordance with the idea that fasciation is caused by an excess of water-supply. Examination of material failed to reveal any trace of larvæ, which in some cases, is said to inflict slight wounds resulting in fasciation.

The second malformation observed—occurring on the same twig where fasciation develops or another *Casuarina* tree in the same locality—is a cork-screw-like twisting of the green needle shoots accompanied by a general enlarging in size (1) (Pl. Fig. II., b). This spiral twisting has been observed in many *Compositæ*, *Dipsaceæ*, *Dianthus*, *Equisetum* (2). It is said to occur only in

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(1) Various names have been given to these twistings. A *Braun* first gave the name "zwangsdrehungen", "Strophomanie" (Schimper), Biastrepis (De Vries).

(2) DeVries: (Die Mutationstheorie Band II) mentions spiral twisting in the case of *Casuarina quadrivalvis* but his figure (Fig. 126) is not at all clear.

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plants whose leaves are arranged in a whorl. The whorled scaly leaves in *Casuarina* take up their position along the line of the spiral. The axilliary buds often develop into normal shoots thus behaving very much in the manner of the fasciated bodies mentioned above.

Sorauer (1) suggests the possibility that this spiral twisting in plants may be a kind of fasciation but brings forward no evidence of the allied nature of the two. The fact that both these structures occur in Casuarina under the same external conditions—excess of water supply—and give rise to normal shoots under dry conditions, lends support to Sorauer's view. In fact both the structures are found occurring on the same branch as Fig. I. in the Plate shows.

Plate.—Fig. I., *Casuarina equisetifolia*; the two malformations occurring on the same twig at *a* and *b*.

Fig. II., 2b, c, d, e: Various malformations to compare with (normal) *a*.

M. J. NARASIMHAN, B.A.

MYSORE AGRICULTURAL DEPARTMENT,
BANGALORE, *December* 1915.

No. XXXIV.—OCCURRENCE OF THE FERN *PERANEMA CYATHEOIDES* AT A COMPARATIVELY LOW ALTITUDE.

According to Colonel R. H. Beddome (Bed. *Ferns of British India*, 1883, p. 22) *Peranema cyatheoides* (Don) has been found in Nepal, Bhootan, Khasya, and Anamallys at heights between 4,500 to 10,000 ft. above the sea level. Lala Shiv Ram Kashyap, B.A. (Cantab.), M.Sc., Professor of Botany, Govt. College, Lahore, collected last summer during his tour in Garhwal some pinne which could only be referred to the same species. The place where he found them is near Mandal Chatti in the valley between the Alaknanda and the Mandakini at a height between 3,000 and 3,500 ft. above the sea level. The sori are globose and on the back of veins, indusium pedicellate, inferior and globose; veins free and forked; ultimate pinnules sessile.

S. L. GHOSE, M. Sc.,
Asstt. Professor of Botany, Govt. College.

GOVT. COLLEGE, LAHORE,
8th April 1916.

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(1) Sorauer: Handbuch der Pflanzenkrankheiten Bd. 1. Die nicht-parasitäre krankheiten.
Sorauer says "Wir glauben dass es kein unzutreffendes Bild ist wen wir diezwangsdrehung eine tonnen-forming anfgeblasene Fasciation ansehen.

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PROCEEDINGS

OF THE MEETING HELD ON 17TH FEBRUARY 1916.

An "At Home" and Meeting of Members and their friends of the Bombay Natural History Society took place on the 17th February, Mr. E. Comber, F.Z.S., presiding.

The election of the following 20 members since the last meeting was announced :—Mr. R. D. Macleod, I.C.S., Aligarh ; Dr. N. S. Williams, M.D., B. Sc., Abu Road; Mr. T. V. Ramakrishna Aiyer, Coimbatore ; Mrs. E. M. Harker, Nasik : Mr. S. B. Hudlikar, M.A., Indore ; Mr. L. K. Elmhirst, Ahmednagar ; Mr. W. S. Hoseason, Bombay; Mr. M. Ramen Pillai, Trevandrum ; Mr. V. H. MacCaw, Calcutta : Miss B. Colvin, Rajputana ; Lt. C. J. Daniels, Peshawar : Major G. Oldfield, Taunggy ; Mr. H. F. Doran, Abu Road ; Shrimant Sampatrao Gaikwad, Baroda ; Miss Molesworth, Pakokku, Burma ; Mr. E. D. Cockburn, Lahore ; Mr. J. R. Taylor, Topchanchi *via* Gomoh ; The Hon'ble Raja Jawahir Singh, Sarangarh, C. P.; The Mess Secretary, 2nd Battalion, 123rd Outram's Rifles, Baroda, and the Rev. Father A. Steichen, S. J., Bombay.

ELECTION OF THE COMMITTEE.

The following gentlemen were elected as office bearers for the present year :—

PRESIDENT—H. E. The Right Hon'ble Lord Willingdon, G.C.I.E.

VICE PRESIDENTS—Mr. J. D. Inverarity, Hon'ble Mr. Justice N. C. Macleod and H. H. The Rao Saheb of Cutch, G.C.I.E.

MANAGING COMMITTEE.—Mr. T. Bainbridge Fletcher, F.E.S. ; Mr. T. R. Bell, I.F.S. ; Mr. C. L. Burns ; Mr. E. Comber. F.Z.S. ; Lt.-Col. G. H. Evans, C.I.E. ; Major W. H. Evans, R. E. ; Prof. G. A. Gammie ; Mr. F. Hannyngton, I.C.S. ; Mr. G. S. Hardy, I.C.S. ; Mr. N. B. Kinnear : Lt.-Col. K. R. Kirtikar, I.M.S. (Retd.) ; Major W. G. Liston, C.I.E., I.M.S. ; Mr. F. M. Mackwood ; Mr. R. A. Spence ; Lt.-Col. F. Wall, I. M.S., C.M.G., C.M.Z.S. ; Mr. John Wallace, C.E. ; Mr. A. H. A. Simcox, I.C.S. ; Revd. E. Blatter, S.J.; Lt.-Colonel W. E. Jennings, I.M.S., and Professor V. N. Hàte.

HONORARY SECRETARY—Mr. W. S. Millard; HONORARY TREASURER—Mr. L. Robertson, I.C.S.

The Honorary Secretary acknowledged the following contributions since the last meeting :—

Contribution.	Locality.	Donor.
7 Skulls of Himalayan Ibex, *Capra sibirica*.	Chamba ..	H. H. The Raja of Chamba.
1 Bison head, *Bibos gaurus* ..	Burma ..	Mr. A. H. A. Simcox, I.C.S.
1 Barking Deer, *Muntiacus malabaricus*.	Karwar ..	Mr. G. Monteath, I.C.S.
1 Goral, *Nœmorhedus goral* ..	Nowshera ..	Mr. J. D. Grafton Wignall.
1 Desert Fox, *Vulpes leucopus* ..	Kundwall near Lila Station, Salt Range.	Dr. M. Stuart.

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Contribution.	Locality.	Donor.
1 Hog Badger, *Arctonyx taxoides*..	Falam, Burma ..	Mr. J. M. Wright, I.C.S.
1 Indian Marten, *Martes flavigula*.	Lashio, Burma ..	Mr. C. Innes.
1 Golden Cat, *Felis temmincki* ..	Bangkok ..	Dr. Malcolm Smith.
1 Panda, *Ælurus fulgens* ..	Gangtok ..	Mr. C. H. Dracott, C.E.
2 Blood Pheasants, *Ithagenes cruentus*.		
1 Skull of Wolf, *Canis* sp...		
33 Butterflies		
1 Gibbon, *Hylobates hoolock*.	Shot 100 miles N. of Myitkyina.	Mr. F. C. Lowis.
2 Crab eating Mongoose, *Mungos urva*.		
1 Hedgehog, *Erinaceus macracanthus*.	Fort Sandeman, Singhar, Baluchistan.	Capt. F. E. W. Venning.
1 Mouse Hare, *Lagomys flavescens*.		
1 Rat, *Tatera* sp.		
1 Fox Skull, *Vulpes* sp. ..		
2 Owls, *Asio accipitrinus*, *Syrnium biddulphi*.		
1 Fox, *Vulpes bengalensis*	Ahmednagar ..	P. J. Mead, C.I.E., I.C.S.
1 Skull of Serow, *Capricornis rubidus*.	Sagaing, Burma..	Mr. B. S. Carey, C.I.E.
11 Wolf Skulls, *Canis pallipes* ..	Shajahanpur ..	Collector of Shajahanpur.
1 Jungle Cat, *Felis affinis*..	Godhra ..	Mr.C. Hudson, I.C.S.
1 Ant Lion, *Myrmeles* sp ..		
4 Harlequin Bats, *Scotomanes ornatus*.	Kurseong ..	Mr. C. Primrose.
1 Markhor Skin, *Capra falconeri*..	Gilgit ..	Major Macpherson.
1 Chameleon (alive), *Chameleon calcaratus*.	Andheri ..	Mr. J. P. D'Mello.
1 Jungle Cat, *Felis affinis*..	Agar, Malwa ..	Capt. E. D. Colvin.
1 Skin of Russell's Viper, *Vipera russelli*.		
1 Toddy Cat, juv., *Paradoxurus hermaphroditus*.	Laza, Putao Dist.	Capt. J. E. Power.
1 Rat		
2 *Typhlops diardi*		
1 Skink, *Lygosoma maculatum*		
1 Millipede and a few spiders		
1 White-crested Kalij Pheasant, *Gennaeus albocristatus*.	Chakrata ..	Major R. W. Burton.
5 Stiff-tailed ducks, *Erismatura leucocephala*.	Zangi Nawar, Baluchistan.	Capt. J.E.B. Hotson, I.C.S.
1 Grey Lag goose, *Anser ferus* ..	Khairpur Mirs ..	Mr. J. Crerar, I.C.S.
1 Close barred Sand-grouse, *Pterocles lichtensteini*.	Sarwakai, Wano, Waziristan.	Capt. F. L. Hughes.
1 John's Earth Snake, *Eryx johni*.	War Camp, Ahmednagar.	Mr. E. O. Bloech.

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Contribution.	Locality.	Donor.
1 Flamingo, *Phœnicopterus roseus* ..	Aden ..	Capt. J. L. Kane.
1 Bat, *Taphozous longimanus* ..	Santa Cruz Bombay ..	
7 Lizards in spirit..	Sheriba, Mesopotamia.	Capt. F. C. Fraser, I.M.S.
2 Smews, *Mergus albellus*	Mancher Lakes, Larkana.	Mr. W. H. Lucas, I.C.S., C.S.I.
7 Birds	Chin Hills, Burma.	Mr. J. M. D. Mackenzie, I.F.S.
1 Close barred Sand-grouse, *Pterocles lichtensteini.*	Lhandi, 20 miles out of Karachi.	Mr. J. M. S. Culberton.
Several beetles, butterflies, and Insects 9 Bats .. .. .. 1 Weaver bird, *Ploceus baya*	Soccorro, Bardez, Goa.	Mr. P. F. Gomes.
Scorpions, Lizards, Spiders, Snails, Dragon Flies, Grasshoppers and Moth.	Deolali ..	Mr. N. B. Kinnear.
1 Chameleon (alive), *Chameleon calcaratus.*	Ahmedabad ..	Mr. Davis.
1 Nest with 3 eggs of Indian Redstart, *Phœnicurus ochruros rufiventris.*	Shinghar, Baluchistan.	Capt. F. E. W. Venning.
1 *Vipera libetina*	Anzac, Gallipoli..	Major W. R. Battye, I.M.S.
Few Rats, Shrews, Centipedes, Snakes, Bats 1 Burmese Serow, *Capricornis rubidus.*	Rangoon ..	Dr. H. H. Marshall.
18 Snakes .. .. .. 6 Lizards .. .. .. 3 Frogs .. .. .. 1 Bat	Various ..	Capt. F. E. W. Venning.
3 *Xylophis perroteti*	Ootacamund ..	Surgeon General W. B. Bannerman, C.S.I., I.M.S.
A number of heads of Pirao (*Caranx* sp.).	Jask, P. Gulf ..	Major W. H. Lane.

Minor contributions:—Col. Pottinger; Mr. Hicky Jones; Mrs. Panday; Dr. E. H. Hankin; Mr. P. Morris; Mr. F. H. Sprott; Major A. S. Capper; Agency Surgeon, Miranshah; Mr. T. Clear; Lt.-Col. W. Ogilvie, I.M.S.; Mr. W. S. Millard; Mr. C. D. Baker; Mr. L. Newcome; Mr. J. Mullen; Mr. E. O. Shebbeare; Mr. H. Gill; Mr. A. S. Campbell; Capt. J. L. Kane; Lt.-Col. A. Wilson; Mr. Cameron; Mr. Baini Parshad, Mr. C. H. Malan; Lt. Saunders; Lt. Anderson; Mr. L. Crawford; Mr. E. Comber.

THE ACCOUNTS FOR 1915.

Mr. L. Robertson, I.C.S., the Honorary Treassurer, said the opening balance at the credit of the Society was Rs. 2,394-6-3 and the closing balance is Rs. 5,686-2-8, showing a profit on the year's work of Rs. 3,291-12-5.

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The income for the year was to the nearest Rupee Rs. 33,784 which compares unfavourably with the income of the previous year (1914), amounting to Rs. 47,566.

Apart from the smaller amounts received for publications of the Society such as the Snake book and the Pigeon book, the most serious item for consideration in connection with this decrease in income, is a fall in the amount received for entrance fees from Rs. 1,480 to Rs. 790. In other words new members in 1915 were only one half of those that joined in 1914. The present condition is brought about by the effects of the War which has withdrawn almost the whole of the regular Garrison from the country and this has been largely replaced by Regiments of the Territorial Force. The Officers, however, of the Territorial Force are not likely to join in large numbers as their stay in the country, as expected by themselves at any rate, is likely to be extremely limited.

There is also a tendency for resignations to come in. The annual subscription is only Rs. 15 and in return members get 4 numbers of the excellent Journal of the Society. It is hoped that members will cease from resigning.

Apart from fixed deposits and cash balance, the expenditure of the Society was for the year 1915 Rs. 28,098 compared with Rs. 45,172 in the previous year. It will thus be seen that the decline in income has been met by economy in administration. It will be noticed that the Journal account is down from Rs. 20,362 to Rs. 9,309 but in addition some Rs. 3,500 have still to be paid off on account of outstanding bills so that the real cost has been Rs. 12,809. The decrease is chiefly due to a smaller expenditure on illustrations.

The invested funds of the Society have not been touched and remains at Rs. 43,000 and we also have a Fixed Deposit of Rs. 5,000 with the Eastern Bank.

Mr. Kinnear, Curator of the Museum, voluntarily offered to go on half pay as his time is now much occupied with the duties at the Brigade Staff Office and the Society owe him a debt of gratitude for his generous offer which has been accepted and which will make considerable saving in expenditure in the current year.

Mammal Survey Fund Account

The opening balance was Rs. 14,860 and the closing balance Rs. 8,526, showing a net deficit of Rs. 6,334 being the difference of Rs. 1,671 and expenditure Rs. 8,005. During the year our remaining collector, Mr. Crump, returned to England to join the Army.

All the collectors having thus gone to fight for their country, field work has ceased except for the operations of one assistant, who is working with success in the Bhutan Duars. This costs only Rs. 100 a month and is worth incurring in view of the work being done.

When full operations are recommenced after the war, an appeal will have to be made for more funds.

A vote of thanks was passed to the Honorary Treasurer and to the Honorary Secretaries for their work on behalf of the Society during the year.

Mr. Kinnear, the Curator of the Museum, drew the attention of members present, to the collection of squirrels exhibited which had just been returned by the British Museum (Natural History) and which had been arranged in the same order as they were found to occur on the Chindwin River by Mr. G. C. Shortridge and the late Capt. S. A. Macmillan when collecting for the Mammal Survey. They formed what Mr. Oldfield Thomas and Mr. Wroughton described as—"The most wonderful series that has

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ever come to the National Museum from any one district".—A coloured plate of these new varieties of Squirrels and a Map of the Chindwin River would be found in the Journal just issued, No. 2, Vol. XXIV.

Other specimens which had been forwarded by members from Mesopotamia and elsewhere were also described.

The Secretary announced that Professor Maxwell-Lefroy had kindly consented to deliver a lecture on "The Prevention and the treatment of Vermin, Flies and other insects at the Front" before the Society on Tuesday, the 14th March.

A vote of thanks to the Chairman terminated the meeting.

PROCEEDINGS OF THE MEETING HELD ON 15TH MARCH 1916.

A meeting of the Bombay Natural History Society was held at the Elphinstone College on Wednesday, March 15th, 1916, the Hon'ble Mr. Justice Macleod presiding, when Professor H. Maxwell-Lefroy lectured on "The Treatment of Flies and Vermin at the Front".

The lecturer described the outbreak of vermin which took place in the British Expeditionary Force during the first few months of war and the efforts made to cope with it when the authorities became aware of its importance.

In Serbia the epidemic of typhus was due to the prevalence of lice and to the fact that typhus cases were found in the hospitals in Belgrade when the Serbians retook the City.

In France and Flanders, great care was now taken to prevent any infection of typhus and the plague of vermin is now coped with. The methods and remedies were described: these are explained in a pamphlet of which copies will shortly be available in Bombay.

The lecturer then dealt with methods of checking and preventing flies: the housefly must be distinguished from the blowfly, as the two have different breeding habits, though both are disease carriers.

Among the methods described were those used to prevent fly breeding in manure, the poisoning of flies with arsenical solutions, the trapping of flies in window traps, the use of liquids for making fly papers, and the new method of killing flies by means of liquids diffused in the air.

These have been tested by the Army Medical Authorities and adopted by the War Office: it is hoped that the latest "fly spray" will soon be obtainable in India. Medical Officers requiring copies of the pamphlet may obtain them from the Secretary of the Society, but only a limited number are available.

The Hon'ble Mr. Justice Macleod in moving a vote of thanks to the lecturer referred to the great importance of this subject and the meeting then terminated.

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JOURNAL
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THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. Stuart Baker, F.L.S., F.Z.S., M.B.O.U.

Part XX.

With a Coloured Plate.

Phasianidæ.

Genus—*CROSSOPTILON.*

The Genus *Crossoptilon* contains those birds popularly known as "Eared Pheasants" from the fact that their ear-coverts are so prolonged that they stick out well behind the head like two small horns. In colour they vary from almost pure white to a dark slate grey or cinereous brown, and in general appearance are, perhaps, closest to the pheasants of the genus *Gennæus*, but differ very much in the character of their tails, which are very broad at the base, less compressed, and with the webs very broad, soft and decomposed.

The tail feathers number from 20 to 24 in different species. The group containing *tibetanum* and *drouynii* have 20 rectrices, *manchuricum* has 22 and *auritum* has 24. *C. harmani* appears to have only 20 but all the skins I have been able to examine were in heavy moult. The wings are rounded in typical pheasant shape, the fifth and sixth primaries being the longest, and the first comparatively short; the sides of the head are naked, red and covered with fine papillæ. The males have short, blunt spurs on their tarsi which are not found on the females.

The sexes are apparently similar in colour, but it may be that females retain the darker colouration of the first plumage longer than the males.

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They are found only at great elevations in the mountain ranges, extending from Tibet to Eastern China.

In the Hand-List of Birds Sharpe admits five species in this genus, *i.e.*, *tibetanum*, *leucurum*, *manchuricum*, *auritum* and *harmani*.

At present the number of specimens of these fine pheasants available for examination is really too small to allow of any final decision to be made as to the extent to which they intergrade and as to what shall be considered good species and what merely geographical races or subspecies.

There appear to be three well defined forms; one, *tibetanum*, in which the colour above is practically pure white or pale grey, a second, *auritum*, in which the colour is dark grey, and a third, *manchuricum*, in which the colour above is cinereous or brown rather than grey. Even between these, however, it is not always easy to define where *tibetanum* ends and *auritum* begins, for hardly any two birds are precisely alike, and a further difficulty which complicates the matter is the want of precise data on several of the few skins we have been able to examine.

When we come to the question of subspecies, we are confronted with an even harder task. Here we have in some instances skins of birds taken on the same expedition, allotted to different races, although there is absolutely nothing to show that they were not all collected in the same place, and, again, of one species, *leucurum*, we have two birds selected as the male and female types which are far less alike than are several other specimens which are given a different specific rank.

There appears however to be in addition to the primary differences between the white and grey forms two minor variations in both of these. In each form there is one race which has no white on the tail feathers, and a second in which there is a certain amount of white or grey generally present, and moreover the absence or presence of this white is accompanied with other fairly stable characteristics, such as the colour of the outer webs of the primaries.

It seems fairly well proved, also, that these variations are found within certain areas, on the boundaries of which the birds met with are intermediate in their characteristics, a feature which one naturally expects in geographical races or subspecies which have not yet risen to the status of true species.

Thus we have two forms of *tibetanum*, one with and the other without white bases to the tail feathers, and the former with grey-brown webs to the outermost primaries, and the latter with white or whitish webs. These two forms should be known as *tibetanum tibetanum* and *tibetanum drouynii*.

In the species *auritum* we have a similar case of two races, *auritum harmani* with no white on the tail and *auritum auritum* with white bases to the tail feathers, and a much broader ring of white round the head.

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I find I cannot distinguish between *drouynii* of Verreaux and *leucurum* of Seebohm, though it may be possible to do so when we have more material with the exact localities and dates given.

The specimens in the British Museum have not been examined and overhauled for a long time, and many appear to have been misnamed. Thus, whilst two of Thorrold's and Bang's birds from the Sok Pass in Tibet form the types of *leucurum*, another collected near the Sok Pass by the Duc d'Orleans is labelled *tibetanum*, and others again from the same expedition are referred to *leucurum*. Further there are three beautiful specimens collected by Thorrold and Bangs at the same place and at the same time as the types of *leucurum* which are labelled *tibetanum*; presumably they have been so labelled because they have no white on their tails, but their grey lateral tail patterns and very pale grey or white primaries show them to be *leucurum* or *drouynii*.

Verreaux type of *drouynii* was collected by Pére David at Moupin and there are specimens from this locality in the Museum, labelled *tibetanum* collected by Pére David which can, like Thorrold's and Bangs' birds be distinguished at a glance from true *tibetanum* from elsewhere by their whiter plumage, grey, rather than black, bases to the tails, and above all by their almost pure white wings with white outer webs to their primaries.

The white on the tail feathers of *leucurum* (vel. *drouynii*) appears to vary immensely. The type ♂ of *leucurum* has only the terminal two or three inches of the tail feathers, together with the shafts and narrow shaft stripes, black; the rest of the tail white running through dark grey into the black. The female type has very little white on the tail, and in some other specimens there is none, *but in every bird the bases of the lateral tail feathers, whether they have white on them or not, are grey, not glossy black as in true tibetanum.*

Verreaux in his Latin definition of *drouynii* writes, "rectricibus basi albis," leading one to suppose that the bases of the tail feathers are pure white, but in the French description he says of the outer tail feathers, "Their rectrices, of which the rachis are black, and greyish white on a portion of their bases." Both Elliott's plate and that of Verreaux depict the bases of the tail feathers of a quite dark grey, changing to black on their terminal halves.

Elliott in his Monograph of the *Phasianidæ* points out that *drouynii* differs from *tibetanum* "first, by the colours or the primaries which are brownish in *C. tibetanum* but greyish white in our new species. But the greatest difference is that the outer tail feathers are not only not black, but want the white spots so characteristic in the other species. We would also remark that the middle tail feathers are not so large, nor do they possess the shining golden green of the birds described by Hodgson." It must e remembered that the specimen which Hodgson made his type of

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tibetanum is a very abnormal bird with numerous large white spots or patches on the tail feathers, a pattern I have seen in no other specimen.

If, therefore, as seems to me to be proved beyond doubt *drouynii* and *leucurum* are one and the same bird, the latter becomes a synonym of the former.

KEY TO SPECIES AND SUBSPECIES.

A.—Colour above white or pale grey.
- *a.* No white or grey on tail; outer webs of primaries dark ... *tibetanum tibetanum.*
- *b.* Tail; feathers partly white or grey; outer webs of primaries white or very pale grey ... *tibetanum drouynii.*

B.—Colour above dark grey.
- *a.* No white on tail ... ... *auritum harmani.*
- *b.* Tail feathers partly white ... *auritum auritum.*

C.—Colour above brownish, not grey ... *manchuricum.*

The position of *harmani* is rather difficult to define. In general appearance it is very close to *auritum* and certainly seems to rank as a subspecies of that bird. On the other hand the number of tail feathers would seem to show it to be nearer *tibetanum*.

The group *tibetanum* (*leucurum*) *drouynii* and *harmani* have 20 tail feathers, whereas *auritum* has 24 and *manchuricum* has 22.

The type of *harmani* has 19 feathers and is incomplete; the male and female presented by Capt. Bailey, to the Museum, are in moult but seem to have had 20 tail feathers, the others of the fine series obtained by this latter collector, with the exception of one skin, are now merely stuffed specimens in a glass case in a private collection, but they were examined by me prior to being so mounted and though in most cases incomplete or moulting seemed to have had in no case more than 20 tail feathers. If this eventually proves to be invariably the case *harmani* will have to be elevated to the rank of species and the above key modified accordingly.

CROSSOPTILON TIBETANUM TIBETANUM (Hodgson).

The Tibet or Pale Grey Eared Pheasant.

Phasianus (*Crossoptilon*) *tibetanus*.—Hodgson, Journ. As. Soc., Beng. VII., p. 864, pl. 46 (1838), *id.*, Ind. Rev. III., p. 593, pl. (1839).

Crossoptilon tibetanum.—Hodgson in, Gray's Zool. Misc. p. 85 (1844); Sclater, List Phasianidæ p. 6, pl. 4 (1863); David Vou. Arch. Mus. Bull, VII., p. 11 (1871); Elliot, Mon. Phasianidæ, 1, pl. 14 (1872); David and Oustalet, Ois. Chine, p. 407, pl. 107 (1877); Hume, Stray Feath., VII., p. 426 (1878); Scully, Stray Feath., VIII., p. 343 (1879); Oustalet, Ann. Sci. Nat. (7), XII. p. 315 (1892) [part];

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Ogilvie-Grant, Cat. Birds B. M., XXII., p. 293 (1893); Ogilvie-Grant, Hand-L. Game Birds, I., p. 252 (1895); Davies, Ibis (1901) p. 409; Bailey, Journ. Geog. Soc., XXXIX., pp. 339, 346 (1912); *id* Bom. Nat. His. Journ., XXII., p. 367 (1913); Finn, Indian Sporting Birds, p. 194 (1915).

Crossoptilon auritum.—Gray, Genera B., III., p. 495, pl. CXXV. (1845).

Crossoptilon tibetanum.—Hume and Marshall, Game-Birds, Ind. I., p. 115, pl. (1878); Seebhom, Ibis (1891) p. 378; Sharpe, Hand-L. I., p. 35 (1898); Oates, Eggs B. M., p. 53 (1901); Dresser, Manual Pal. B., p. 671 (1903).

Vernacular names.—Chakgong, Chakai (*Tibetan*); Boté-Dafé (*Nepal*); Machi (*Chinese*).

Description—Adult Male and Female.—Crown of head covered with short, black, curly, velvety feathers; wing quills ashy brown, the inner secondaries more a slaty-gray, faintly glossed on the visible portions with blue; the wing coverts grade from white, merely tinged with grey on the smallest coverts, to grey almost as dark as that of the primaries and the greater coverts; tail purple bronze at the base, shading through metallic green to deep purple-blue on the terminal half. Remainder of plumage white.

The purity of the white varies greatly in different individuals; in a few it is practically pure white, but in the majority it is much suffused with grey. In two specimens the backs are sufficiently grey to cause this part of the plumage to contrast decidedly with the pure white lower back and rump.

Colours of soft parts. Male.—Iris reddish yellow, legs brilliant scarlet red, claws more horny and tipped darker; naked skin of face red.

Female.—"Length 31½", iris yellow, bill pinkish, legs scarlet, toes grey; Ba-la-to 12,000'." (F. M. Bailey). The naked skin of the face is scarlet, practically as bright as that of the male; the toes are horny red, tipped darker.

Dimensions.—Length 30 to 35 inches; bill at front about 1·75" (=44·5 mm.) and from gape about 2" (=50·8 mm.); tarsus about 3·5" (=88·9 mm.); tail from 18" to 22" (=457·2 to 559·0 mm.); wing from 11·50" (=292·1 mm.) to 13·25" (=336·5 mm.).

With the material available for comparison, consisting largely of unsexed specimens, it is impossible to say whether there is any difference in the size of the sexes, but it would appear not.

Distribution.—The mountains of Western China and extreme East Tibet. More full and accurate data are still required to show where this bird meets and grades into the next form *drouynii*.

South it is at all events found as far as the Tongla, the pass at the head of the Irrawaddy Valley, where Capt. F. M. Bailey found it numerous. It may well be found later on in the higher ranges of N. E. Yunnan.

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Nidification.—There is nothing on record about the nesting of this bird in a state of nature. Bailey found it breeding at Tachienlu in the middle of May at about 12,000 feet, but failed to find its nest.

Seebohm records of 5 eggs that they "vary in size from 2·42″ × 1·7″ to 2·3″ × 1·72″. In colour they resemble eggs of *Perdix petrosa.*"

The only specimen I have in my own collection is one purchased for me from some of the Tibetan feather dealers who at one time annually visited Darjiling to dispose of their wares. The skins of two birds said to be the parent birds were purchased with it. This egg was reputed to have been taken at a place called Mizsim in N. E. Tibet between the 1st and 10th June, 1892. The appearance of skins and egg when purchased corroborated the date given. The egg is much like that of an ordinary fowl, but of a more smooth and satiny texture with a finer, closer grain. It is coloured a pale buffy grey, and is an ordinary oval in shape, measuring 2·2″ (= 55·4 mm.) × 1·66″ (= 42·1 mm.). It does not agree in appearance with the eggs described by Seebohm, but it agrees in texture, shape and size with those of other species of Eared Pheasants laid in captivity, and only differs in colour in being more buff and less green.

There is a fair series of this Pheasant's eggs in the British Museum taken by A. E. Pratt at Ta-tsien-la, consisting of three clutches of three, four and five eggs respectively. All these eggs were taken in May, the clutch of five, which were evidently very hard set when taken on the 18th of that month. In colour these eggs vary very considerably, the clutch of four is a very pale stone colour, the clutch of three a rich buff, and the third clutch intermediate between the two. The texture also differs considerably, the first mentioned clutch having a very fine smooth surface more like that of a duck's egg than a fowl's egg, whilst the second has the surface covered with innumerable tiny pores or pits. The third clutch is here again intermediate between the other two. All have the grain close, extremely hard, and with considerable gloss. All the eggs could be easily matched with those of the domestic fowl.

In shape they vary from an ordinary to a broad oval.

The variation in length is between 2·29″ (58·2 mm.) and 2·46″ (61·6 mm.), and in breadth between 1·70″ (43·2 mm.) and 1·76″ (44·7 mm.), the average of the twelve being 2·36″ × 1·71″ (59·9 × 43·4 mm.).

The breadth is peculiarly constant, the two larger clutches containing seven eggs which measure 43·2 mm. and two measuring 43·4 mm.

General Habits.—The fullest account of the habits of this Pheasant is that given by Père David, but though it has often been quoted as referring to *tibetanum*, it undoubtedly refers, in part at all events, to the race *drouynii*, the type of which was obtained by Père David at Moupin.

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Pére David writes:

"Hodgson's Eared Pheasant inhabits the pine forests at "elevations varying from 10,000 to 12,000 feet above sea-level. "It is extremely sociable in its habits, and it is said that 40 or "50 may be found roosting in companies in the pine-trees.

"It is only to be met with in some of the wooded localities "of China in the high mountains of Western Szechuen, in the "neighbourhood of Moupin and Ta-tsien-lou, where its exis- "tence is protected by the superstitious respect of the natives. "It is a very gregarious bird, loving to live in company with "many of its kind, even when engaged in rearing its young, "and it does not wander far from the place where it is bred. "It feeds on leaves, roots, grains and insects. Fortunately for "its safety, the flesh of this Eared Pheasant is but moderately "good to eat, and sportsmen prefer the smaller Pheasants "(Phasianus) as game, since they are more widely distributed "and easier to procure."

Davies in the "Ibis" adds a few more particulars. He writes:

"These Eared Pheasants were common in the same sort of "localities as the Blood Pheasants. They were found in large "coveys and run very fast, scarcely ever flying, while they are "so wary that though I saw a great many, I could never get "near enough for a shot. Their call is a very loud harsh "crow, which can be heard for a mile or two. They keep to "high altitudes, and are often found in the snow. The "furthest south I have seen them is a little above lat. 28° to "the N.E. of Chung-tien."

CROSSOPTILON TIBETANUM DROUYNII, Verreaux.

Pére David's Eared Pheasant.

Crossoptilon drouynii.—Verreaux, Nouv. Arch. Mus. Bull., IV., p. 85, pl. III. (1868); Swinhoe, P.Z.S. (1871) p. 399; Elliott, Mon. Phasianidæ 1, p. XVIII., pl. 15 (1872).

Crossoptilon tibetanum.—Oustal., Ann. Sci. Nat. (7) XII., p. 315 (1892) pt.

Crossoptilon leucurum.—Seebohm, Bull. B.O.C. I., p. 17 (1892), *id.* Ibis, 1893, p. 250; Ogilvie-Grant, Cat. Birds B.M., XXII., p. 294 (1893); *id.*, Hand-L., Game Birds 1, p. 253 (1895).

Crossoptilum leucurum.—Dresser, Manual Pal. Birds, p. 671 (1903).

Vernacular Names.—Chakgong, Chakai, (*Tibetan*); Boté-Dafé, (*Nepal*); Machi (*Chinese*).

Description.—Adult Male and Female.—Differs from *tibetanum* in being generally a much purer white on the upper plumage, more

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especially on the wings, whilst the outer webs of the primaries are either pure white or a very pale grey instead of brown or brown-grey of quite a dark tint. The bases of the outer tail feathers are often white, in some specimens, as in the type of *leucurum*, this white extends to practically the whole of the centre tail feathers, and all the outer ones, in others it only extends to 4, 6, or 8 of the outer pairs of feathers, whilst in some there is practically no white. In all specimens of *drouynii* however the basal halves of the tail feathers instead of being glossy black, as in *tibetanum*, are grey.

The colours of the soft parts are the same as in *tibetanum*.

Dimensions as in *tibetanum*.

The types of *leucurum* were collected by Thorrold and Bangs between the Sokpo Pass and Chiamdu and the type of *drouynii* by Pére David at *Moupin*. There are, however, other specimens, collected at the latter place, in the British Museum as well as one in the Tring Museum which are all named *leucurum*, whilst on the other hand there are specimens of Eared Pheasants collected by Duc d'Orleans between Sokpo and Chiamdu which, although named *leucurum* are quite indistinguishable from the type of *drouynii*.

This is in itself enough to prove that the two birds *leucurum* and *drouynii* are the same, for we cannot have two subspecies living in one and the same habitat.

The type of *tibetanum* is a bird with white spots on the tail, and it would seem that this white is more an individual than a subspecific character and the points to be relied on in distinguishing *drouynii* from *tibetanum* are the primaries and their comparative whiteness and the absence or presence of grey next the black of the tails.

Distribution.—Apparently north-west and west of the area inhabited by the Pale Grey Eared Pheasant between the Sokpo Pass and Chiamdu and at Moupin. The exact point at which the Duc d'Orleans obtained his specimens is not known.

Nidification.—Nothing known.

Habits.—Pére David's notes, as already recorded, refer to this bird certainly as much, possibly more, than to the previous bird.

Although the particular bird selected as the type of female *leucurum* from the series collected by Thayer and Bangs is as described by Ogilvie-Grant in his Game Birds, it should be noted that there is no reason to think that the female differs from the male any more than the females of the other species do. The type female is assuredly a most atypical bird, possibly a young one, and possibly not even a female at all. On the other hand, the male type will almost equally certainly prove to be an exceptionally old and beautiful specimen with an abnormal amount of white on the tail.

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CROSSOPTILON AURITUM AURITUM (Pall.)

Pallas' Eared Pheasant.

Phasianus auritus.—Pall, Zoog. Rosso. Asiat. II., p. 86 (1811) Sclater, Ibis (1874) p. 170.

Crossoptilon auritum.—Gray, Hand-L. Birds, II., p. 259 (1870); Swinhoe, Proc. Zool. Soc. (1871) p. 399; Sclater, Proc. Zool. Soc., (1871) p. 495; Elliot, Monog. Phasianidæ 1, pl. 17 (1872); Prjev., Mongolia, Strand Tangut, II., p. 121; pl. XX., fig. 1 (egg) *id.*, in Rowley Orn. Misc. II., p. 420 (1877); David and Oustalet, Ois. Chine, p. 406, pl. 108 (1877); Prjev., Reisen in Tibet, p. 204 (1884); Pleske Bull., Acad. St. Petersb., XIII., p. 297 (1892); Ogilvie-Grant, Cat. Birds B. M., XXII., p. 295 (1893); *id.*, Hand-L. Game Birds 1, p. 255 (1895); Berez. and Bianchi, Ptitz. Gan-su, p. 24; Styan, Ibis (1899) p. 298; Dresser, Manual Pal. B. p. 673 (1903); Parrot Filchner, Exped. China-Tibet, p. 132 (1908); (egg figured cf. Prjev., Mongol. i., Strand Tangut, ii., p., 121, pl. xx., fig. 1).

Crossoptilon cœrulescens.—David, Ms. Milne-Edwards Comp. Rendu, LXX., p. 538 (1870); *id.*, Ann. Mag. Nat. Hist. (4), V., p. 308 (1870); David, Nouv. Arch. Mus. Bull., VII., p. 11 (1871); Sclater, Ibis (1871) p. 370.

Crossoptilum auritum.—Sharpe, Hand-L. vol. I., p. 35 (1898).

Vernacular names.—Ushasty Fasan (*Kansu*); Hara-takia (*Mongol*); Shan-dgi (*Chinese*); Shariama (*Tanguto*).

Description.—*Adult Male and Female.*—Crown of head from forehead to nape velvety black; chin, throat, extreme foreneck and lengthened ear-coverts white. Above clear slaty blue-grey, the feathers of the neck next the ear-coverts darker, almost black, with the bases of the feathers next the crown white, the white showing as a thin indistinct line. Wing quills brown, remainder of visible closed wing like the back, the inner secondaries glossed with purple blue; below like the back, but somewhat ashy on the vent, abdomen and under tail-coverts; tail with the long decomposed central feathers and those next them dark grey with black tips and edges glossed with Prussian blue; outer five or six pairs of feathers white with the terminal third glossy blue-black, the pair next them mottled black and white at the base.

Colours of soft parts.—Irides yellow and brown, yellow-brown, or reddish yellow; orbital skin and eyelids scarlet; legs scarlet or deep red, spurs pale horny, tipped darker; bill reddish horny.

Measurements.—Total length from 33″ to 40″, according to the length of the tail, which varies greatly in both sexes. Wing from 11·25″ (=286·7 mm.) to 12·75″ (=323·8 mm.); bill at front about 1·5″ (= 38·1 mm.) and from gape about 1·75″ (= 44·4 mm.); tarsus about 3·5″ (= 88·9 mm.). The tail varies from about 18″

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(= 457·2 mm.) to 23·5″ (= 596·9 mm.). This, the longest I have seen, is that of an unsexed specimen in the Tring Museum. It is an old bird with no sign of spurs, and is evidently a female.

The ear-coverts in this species run up to 2·5″ (= 63·5 mm.) or even longer, whereas anything of 2″ (= 50·8 mm.) in the white forms is very exceptional.

Chick.—Above very dark blackish brown, with central streaks of buff and indefinite bars of rufous and brown; the crown is dark brown, not black; on the upper back the slaty grey feathers are appearing; quills of wing mottled brown and dull rufous, below dirty ashy, the slaty grey colour of the adult already showing on the breast. Short tail in colour like that of the adult.

Wing about 9″ (= 228·6 mm.); the ear-coverts well developed and over 1″ (= 25·4 mm.).

Orbital skin bright red; bill much darker than in the adult, maxilla almost black with reddish edges, mandible reddish horny. The legs appear to have been dull horny red, brighter and redder in front than behind.

Distribution.—The Mountain Ranges of Western China, North-West Szechuen, Kansu and the Koko Nor.

Nidification.—Prjevalsky describes the eggs of these Pheasants found in the Kansu and Alaskan Mountains as follows:—

> "The eggs of the present species resemble in shape those of "the barn-door fowl, but are very smooth and of a pale olive "grey colour, without any spots; large diameter 2·16″, small "diameter 1·6″ to 1·63″."

I have two eggs of this Pheasant in my collection which were laid by birds in the Zoological Gardens and purchased by me when Bartlett's collection was broken up.

In shape these eggs are rather long ovals, but little compressed towards the smaller end. The texture is very fine and close, the surface having a distinct gloss and being exceedingly smooth. In colour they are a pale olive grey, and in this and in general appearance are really nearer in appearance to ducks' than to fowls' eggs. One egg which is slightly mis-shapen has also got numerous small nodules on it round its centre, but these are obviously abnormalities.

They measure 2·35″ (59·6 mm.) × 1·6″ (4·6 mm.) and 2·28″ (57·9 mm.) × 1·55″ (39·3 mm.).

There are also four eggs of this bird laid in captivity in the Natural History Museum's Collection; these agree well with those in my own collection, but whilst two are very similar in colour to mine, the other two are more of a pale stone buff without the olive tint.

They measure between 2·22″ (56·4 mm.) and 2·30″ (58·4 mm.) in length, and between 1·59″ (40·4 mm.) and 1·62″ (41·4 mm.) in breadth; the average of all eight eggs is 2·24″ × almost 1·60″ (56·9 × 40·6 mm.).

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Prjevalsky gives the following account of the habits of the Pallas' Eared Pheasant:—

"In both these localities these Pheasants inhabit the wooded "mountainous regions, and ascend to a height of even 10,000 "feet above the sea level. It is a resident, and remains all the "year round in certain places. Water does not seem to be of "so much necessity to this bird as it is to other species of the "present group; at least, it keeps very often to localities in "the Ala-Shan Mountains where not a drop of water is to be "found.

"In autumn and winter they congregate in small flocks, "probably in families, but very early in spring separate into "pairs, when the males at once commence to crow, *i.e.*, uttering "at intervals a loud disagreeable note somewhat resembling "the cry of a peacock. This usually occurs in the morning, "but occasionally also during the day. In the beginning of "May almost all the females sit on the eggs, the number of "which (according to the statement of natives) varies from five "to seven."

"After the breeding-season the males at once commence "moulting, and attain their fresh plumage only in October "again. Generally their feathers very soon get worn, and the "birds are in full plumage only for a short time in winter and "spring.

"We did not succeed in finding any young: but the Tangut "informed me that the young are always accompanied by both "parents. The old as well as the young run very fast and "are very clever in hiding themselves in thick bushes when "pursued, and generally depend more on their legs than upon "their wings.

"Like most of the family, these birds are fond of digging "about in the ground in search of roots; and it appears that "they chiefly feed upon plants."

CROSSOPTILON AURITUM HARMANI, Elwes.

Elwes' Horned Pheasant.

Crossoptilon harmani.—Elwes, Ibis (1881) p. 399, pl. XIII.; Ogilvie-Grant, Cat. Birds B. M. XXII., p. 296 (1893); *id.*, Hand-L. Game Birds I., p. 257 (1895); Dresser, Manual Pal. Birds, p. 673 (1903); Stuart Baker, Bull. B.O.C. XXXIII., p. 121 (1914); Elwes, Bull. B.O.C. XXXIII, p. 136 (1914); Bailey, Bom. Nat. His. Jour. XXIV., p. 77.

Vernacular name.—Cha-nga (*Tibet*).

Description.—Adult Male and Female.—Very similar to *auritum*, but has the upper parts a dark ashy grey, almost black on the neck

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instead of dark blue-grey whilst, on the other hand, the rump is much paler than in that species. The latter also has the colour of the upper parts practically uniform from the nape to the upper tail-coverts. In *C. a. harmani* the white on the cheeks and ears extends in a broad white band across the nape, whereas in *C. a. auritum* there is only a faint indication of the white on the nape; in the former race also the white of the chin extends in a narrow line down the throat and foreneck.

The sides of the neck and upper breast are very deep glossy ashy grey gradually changing to paler ashy grey on the flanks and lower breast and to white in the centre of the abdomen. The tail is of a metallic blue-black, glossed with green and blue, the middle feathers changing to purplish grey at their bases. There is *no white* on the outer tail feathers as in Pallas' Eared Pheasant.

Colours of soft parts.—"♂, length 35¼"; iris orange-brown; bill light reddish horny; legs scarlet; Gyala 10,000 feet" (Capt. F. M. Bailey). The female, except that its length is given as 34⅛", is described by Capt. Bailey as having exactly the same coloured soft parts. In another male, apparently a rather younger bird, Capt. Bailey describes the colour of the iris as "brown."

Measurements.—Total length from 32" to 37". Bill at front about 1·65" (41·9 mm.) and from gape 1·80" (45·7 mm.); tarsus 3·45" to 3·65" (87·6 to 92·7 mm.); wing 11·5" to 12·65" (292·1 to 321·3 mm.); tail 18" to 22" (457·2 to 558·8 mm.). The spurs in a fine male measure over ·75" (19·0 mm.) and appear to have been the same in colour as the leg with darker tips.

Chick.—Probably about fortnight old. Crown velvety black and not brown as in Pallas' Pheasant; upper plumage a dull black changing to dark ashy grey on the rump and upper tail coverts; the shoulders and wings are vermiculated with reddish bars and the wing-coverts have broad reddish fulvous shaft-streaks. The distribution of the white on the head is the same as in the adult, and the long ear-tufts are partially developed, but the white does not extend down the throat; there is a well defined black patch behind and under the ear-coverts.

The upper breast and flanks have the feathers black with the centres and terminal edges fulvous; the lower breast and abdomen are dirty white; the vent and under tail-coverts dull ashy grey with white tips, and the tail feathers are blue-black glossed with blue, which has a tinge of green in certain lights.

"*Young.*—Iris brown; bill horn-coloured, lighter below; legs reddish brown" (F. M. Bailey). The wing of this chick is about 7" (177·8 mm).

Distribution.—Abor and Mishmi Hills and South-East Tibet. Apparently common on all the higher ranges of the extreme North-Eastern watershed of the Brahmapootra River.

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Nidification—Unknown. The young one described above was obtained by Bailey on the 16th July, and another "well grown" young one on the 24th August, whilst broods of freshly hatched young were seen on the 18th July.

This would seem to show that they lay in the last few days of May, June, and possibly July.

They evidently breed at very great elevations, from 10,000 feet upwards, and the actual presence of snow can be no deterrent to their nesting and hatching.

General habits.—For a long time the only known specimen of this bird was a very imperfect skin obtained by Mr. Elwes from a Lieutenant Harman, who had himself received it from one of his native surveyors. This he said he had procured it 160 miles east of Lhasa at an elevation of about 6,000 feet, where it was found in flocks in winter. This was in 1881, and nothing more was ascertained about the pheasant, its habits and habitat until 1913, when Capt. F. M. Bailey sent home a most valuable, though small, collection of bird skins, amongst which there was a beautiful series of Elwes' Eared Pheasants, containing fine examples of males, females and young.

In the Bombay Natural History Journal, Capt. Bailey gives a very interesting account of the habits of this beautiful bird. He writes:

"This bird occurs in Po Me, where I found feathers and "scratchings, though I was never fortunate enough to come on "the birds themselves. It is common in the Lower Tsangpo "Valley in Tibet. The farthest point west at which we saw it "was the east side, Putrang La, where there were numbers in "the rhododendron scrub at about 15,500 feet. The lowest "elevation at which we found this pheasant in the Tsangpo "Valley was at about 9,300 feet at Gyala, but I saw traces of "them in Po Me at about 8,500 feet. In the valley of the "Tsangpo itself the highest point upstream at which we found "these birds was the neighbourhood of Nang Dzong. They "were plentiful in the valley of the Char, which is a branch "of the Subansiri, but none were found west of the Pu La, "which is the watershed between the Tsang Po and Subansiri "in this region. There were many on the Takarla and the Le "La. They were heard calling near Natrampa on the Lower "Chayul Valley, but they do not appear to extend west of these "places. They were said to be common at Tsari in winter, "but we saw none. These birds move about in flocks of "about 5 or 10 and frequent forest-covered hills and the "higher elevations, dwarf rhododendron jungle, where they "feed on the grassy clearings among the bushes. They are "very noisy in the early mornings, and less so in the evening. "Their call is like that of *C. tibetanum*. When alarmed,

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"they usually fly into a tree; the flight is heavy and "usually downhill. The beaters on seeing these birds would "make a noise like the barking of dogs, on which the birds "fly into a tree and are easily shot. They say that if they "do not make this noise the birds fly a considerable distance. "Broods of freshly hatched chicks were seen at Gyala, 10,000 "feet on 18th July. while about the same time a specimen of "a larger chick was shot. A well-grown young one was shot "on the Putrang La on 24th August. These birds are trapped "by Tibetans in the Lower Tsangpo Valley. Adult specimens "in the flesh measured, males 31½", 33¾", 35¼", and females, "34" and 34⅛"."

In *epistola* to me Capt. Bailey adds a few notes which are of interest. He says that although the birds called principally in the mornings, and to a less extent as they were returning to roost at night, they could be heard also at odd intervals throughout the day except perhaps during the two or three hottest hours of the afternoon. They kept very closely to the forest, and only wandered out into the open places in the mornings and evenings, and even then never seemed to venture far, and scurried back to the shelter of the bushes at the least alarm.

He seems to have found both male and female sharing in the care of the young, a fact which would prove that the Eared Pheasants are monogamous in their habits.

CROSSOPTILON MANTCHURICUM, Swinhoe.

The Chinese Eared Pheasant.

Crossoptilon tibetanum.—Lamprey, (nec Hodgs.) Proc. Zool. Soc., 1862, p. 221.

Crossoptilon auritum (sive) mantchuricum.—Swinh., Proc. Zool. Soc., 1862, p. 286; 1863, p. 306.

Crossoptilon auritum.—Sclat., List of Phasianidæ, p. 6, pl. 5 (1863); Milne-Edwards, Nouv. Arch. Mus. Bull. I., p, 12, pl. 1, figs. 1 and 2 (1865); Sclat., Proc. Zool. Soc., 1866, p. 418; Saurin, Proc. Zool. Soc., 1866, p. 437; David, Nouv. Arch. Mus. Bull. III., p. 37 (1867); Bartlett, Proc. Zool. Soc., 1868, p. 115; Gould, Birds of Asia, VII., pl. 22 (1870).

Crossoptilon mantchuricum.—Newton, Ibis (1865) p. 361. David, Nouv. Arch. Mus. Bull. VII., p. 11 (1871); Swinhoe, Pro. Zool. Soc., 1871, p. 399; Sclater, Proc. Zool. Soc. (1871) p. 495; Elliot, Mon. Phasianidæ I., pl. 16 (1872); David and Oustalet, Ois. Chine, p. 405, pl. 106 (1877); Sclater, Proc. Zool. Soc., 1879, p. 118, pl. VIII, fig. 5 (egg); Ogilvie-Grant, Cat. Birds B. M. XXII., p. 294 (1893); Dresser, Manual Pal. Birds, p. 672 (1903); Ingram, Ibis (1909), p. 462.

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Crossoptilum manchuricum.—Ogilvie-Grant, Hand-L. Game Birds, I., p. 254 (1895). Sharpe, Hand-L., I., p. 35 (1898); Oates, Cat. Eggs, B. M., I., p. 53 (1901).

Vernacular names.—Hoké or Hoky (*Chinese*). Ho-chi (*vide* Saurin.)

Description.—*Adult Male and Female.*—Crown velvety brown-black; upper back, whole wings, neck and breast brown, dark and almost black next the head and gradually paling posteriorly on the quills and back. Below in the same way the breast changes from deep rich brown next the neck to pale ashy brown on the abdomen and under tail-coverts. Lower back, rump and upper tail-coverts dirty ashy white. Chin, throat and lengthened ear-coverts white, generally sullied on the throat with yellowish. Central tail feathers white with black shafts and black tips, the latter glossed with purple, in each succeeding pair of feathers the white decreases in extent so that from below the tail appears to be a purple brown or black with merely the long disintegrated plumes of the central tail feathers shining white.

It is interesting to note that a female in the possession of Lord Rothschild in the Tring Museum has a small amount of white on second and third primaries near the bases of the outer webs.

Colours of soft parts.—Naked space surrounding the eyes brilliant scarlet red, bill reddish horny, dark tipped and more red at the base near the nostrils; legs red; the claws reddish horny.

Males with a short blunt spur about ½″ long, reddish at the base and horny brown at the tip.

Measurements.—Bill at front about 1·7″ (43·2 mm.) from gape about 2″ (50·8 mm.) or rather less, lengthened ear-coverts from 1·75″ (44·4 mm.) to 2·50″ (63·5 mm); tarsus, 3·50″ (88·9 mm.) to 3·80″ (96·5 mm.); tail, central feathers up to 26″ (660 mm.); generally about 22″ (559 mm.) to 24″ (609·6 mm.); outermost feathers about 7·5″ (190·5 mm.) to 8·5″ (216 mm.); wings between 11·75″ (298·4 mm.) and 13·0″ (230 mm.).

Chick.—Head fulvous, centre of crown chestnut with two ill-defined dark brown and black coronal stripes; a dark brown streak from the back of the eye running through the ear-coverts to the nape. Above chestnut brown indistinctly barred with black and with two broad longitudinal bands of dirty white; wings dull pale brown more or less mottled and barred with white and fulvous. Below pale dull grey; flanks and thighs marked with pale brown and dull fulvous.

Distribution.—The Mountains of Manchuria and North-Eastern China.

It must be noted that although the original skin received by Swinhoe came from Manchuria no others have since been obtained there and Owston's collectors failed to obtain any there in 1908.

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Nidification.—Misselbrook records of the breeding of these birds that—

"The hens lay from 12 to 16 eggs each at a sitting, the "time of incubation being about 28 or 30 days.

"I have not seen the males take any part in the incubation.

"The great peculiarity in the young of these birds being "their extreme tameness; there is not the least shyness about "them, they being more like the domesticated chicken. The "egg (see plate) is of a uniform pale stone colour and measures "about 2·3″ × 1·7″."

There are three eggs in the British Museum collection, all being eggs laid in captivity. The texture of these is very fine and close with a decided though faint gloss and a smooth surface like that of a duck's egg, but in one of the three there are the same fine pittings already noted in eggs of other birds of the genus. The colour ranges from a very pale olive grey to a pale dirty buff.

Two eggs in my own collection, given me by Mr. H. Munt and which were laid in the London Zoological Gardens, agree well with the above, but are even more duck-like in texture, colour and shape. The five eggs vary in length between 2·05″ (52·1 mm.) and 2·25″ (57·1 mm.) and in breadth between 1·51″ (38·4 mm.) and 1·57″ (39·9 mm.) Like the eggs of all the Eared Pheasants they are very small in proportion to the size of the birds which laid them.

Habits.—Pére David ("Oiseaux de la Chine") writes of this bird; "The Brown Crossoptilon, known in Pekin as Hoky, is resident on some of the wooded parts on the mountains of Péchély, but for some years past it has become very rare, and owing to the war of extermination which is being waged against it and the destruction of its wooded haunts, it cannot be long before it disappears altogether. It is a very gentle and sociable bird, always to be seen in flocks, and it feeds on all sorts of grain, shoots, leaves, roots and insects. It appears to be well fitted for domestication, especially as it is so easy to feed, but a shady park in the vicinity of some stream of clear water would be necessary for it; that is to say conditions similar to those which surround it in its wild state."

Again the same Naturalist remarks (Nouv. Arch. de Mus. Bull.); "A thing which struck me once when I killed two males and one female, all adults, in July, I found four old birds and fifteen young ones all together in one flock. Were these two companies?" (? families) "which had joined forces. These birds perch voluntarily and hold their tails disposed in roof shape (*i.e.*, compressed) and raised high as in an ordinary fowl."

(*To be continued.*)

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SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY.

Note by the Editors.

The Editors' attention has been called to the fact that although Mr. Wroughton's description of *Dremomys lokriah bhotia* was received and passed for press long before Mr. Thomas's synopsis of the Indian species of *Dremomys*, the latter was by accidental error published in the Journal (Vol. XXIV, No. 3, p. 417-418) than the former (l. c. p. 425-426), thus affecting by page priority (though not by date) the nominal authorship of the name *bhotia*.

The Editors are advised that if they formally declare this to be a mistake made during publication, independent of the authors concerned, it may be treated as a "typographical error", and may be corrected accordingly by the ascription of the name *bhotia* to its proper author, Mr. Wroughton.

No. XIV.

(*A*) A new Bat of the Genus *Murina* from Darjiling.

By Oldfield Thomas.

(*Published by permission of the Trustees of the British Museum.*)

Murina rubex, sp. n.

A rusty-washed species looking like a small *Harpiocephalus*.

Size largest of the Indian species, only equalled by the Japanese *M. hilgendorfi*. Fur thick, close, and woolly; forearms and thumbs thinly hairy; hind limbs very thickly hairy, and the interfemoral well clothed; undersurface of limbs and membranes practically naked. General colour above greyish russet, the fur blackish slaty at base, then greyish buffy with ferruginous tips, the long hairs on the limbs and interfemoral deep ferruginous. Below, the chin and throat are creamy whitish to the bases of the hairs, belly dull buffy with slaty bases.

Ears without pointed projection at their inner base; inner margin convex; tip evenly rounded; outer margin with a well defined notch or concavity at its upper third, its middle portion convex, with again at base a concavity followed by a basal convexity buried in the fur; the shape of the ear therefore essentially as in *M. hilgendorfi*, *Harpiola grisea* and *Harpiocephalus*, not as in the other Indian species of *Murina*. The notch at the junction of the upper and middle thirds particularly well marked and characteristic.

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Skull slightly shorter than that of *M. hilgendorfi*, but broader in the interorbital region. As compared with that of *M. huttoni* it is larger and heavier, with decidedly broader forehead. Breadth of muzzle across canines not broader than across premolars, the canines not so broadened transversely as in *huttoni*.

Incisors short and thick, the outer equalling the inner in vertical extent. Canine short, its tip not surpassing that of p^4. Anterior premolar about three-fourths the height of p^4, comparatively smaller in transverse section than in the allied species, its area barely equalling a third of that of p^4, its antero-posterior diameter about equal to the breadth of i^1. Lower premolars also more disproportionate than in *M. huttoni*, the anterior less than one half the area of the posterior.

Dimensions of the type:—Forearm 41·5 mm.—Head and body (in flesh) 47 mm.; tail 35; ear 15.

Skull:—Greatest length 18·5; basi-sinual length 14; zygomatic breadth 10·2; interorbital breadth 5·7; palato-sinual length 8·8; maxillary tooth row 6·2.

Hab.—Darjiling. Type from Pashok, 3500′.

Type.—Adult female. B. M. No. 16. 2. 25. 111 Original number 949. Collected 11th October 1915 by N. A. Baptista. Presented to the National Museum by the Bombay Natural History Society.

This handsome bat has the general appearance of a small *Harpiocephalus harpia* or large *Murina cyclotis*, but is readily recognizable by the characters above detailed, of which, apart from its size, the most evident is the well marked notch on the outer edge of the ear.

(*B*) The Bandicoot of Mount Popa, and its Allies.

By Oldfield Thomas.

When Mr. Shortridge made his collecting trip to Mt. Popa he obtained a considerable series of a Bandicoot, which was at first taken for a *Bandicota*, but afterwards, owing to its striking external resemblance to a *Gunomys*, was put down as belonging to the latter genus. When he came home, however, Mr. Shortridge protested that the animal had absolutely the parasitic habits of *Bandicota*, and not the more countrified life of *Gunomys*.

This being the case I have thought it worth while to investigate the question of its true affinities, and as it proves to be a *Bandicota*, I have also examined the other members of the genus most allied to it.

The genus *Bandicota* has hitherto been divided into two groups, the giant forms allied to *B. gigantea*, and the smaller ones related to

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B. nemorivaga. The Popa animal is still smaller again, with very small teeth, and may be said to represent an equally distinct third group of the genus. It may be called

Bandicota savilei, sp. n.

Size much smaller than in *B. nemorivaga*, not larger than in certain *Gunomys*. Fur coarse and harsh, with very few elongated bristles intermixed with it. General colour above coarsely grizzled and lined greyish brown, more or less suffused with buffy down the dorsal area, greyer on the sides. Ordinary hairs with buffy or creamy tips, the longer hairs blackish brown. Under surface grey, the hairs light slaty basally, whitish terminally. Hands and feet silvery whitish, with brown metapodials. Tail thinly haired, uniform dark brown above and below. Mammæ 3—3=12, but two of the available females have a supplementary pectoral mamma.

Skull very different from that of *B. nemorivaga* by its much smaller size, general narrowness and far smaller teeth. Nasals long and narrow. Superorbital crest strongly developed, forming a thickened bead in the postorbital region, and though less developed, across the parietals. Palatal foramina of medium length, comparatively well open. Bullæ of average size.

Molars conspicuously smaller than in the other species of the genus.

Dimensions of the type, measured in the flesh:—Head and body 240 mm.; tail 230; hindfoot 43; ear 26·5.

Skull:—Condylo-incisive (= greatest) length 52; zygomatic breadth 28; nasals 19 × 5·8; interorbital breadth 6·8; breadth between ridges on parietals 11·5; palatilar length 27; palatal foramina 9; upper molars series 8·7; breadth of first molar 2·9.

Hab.—Mount Popa, dry zone of Burma. Alt. about 2,500'. "Plentiful in Popamyo village and possibly in most towns and villages throughout the dry zone."—G.C.S.

Type.—Adult male. B. M. No. 14.7.19.211. Original number 3767. Collected 14th September 1913 by G. C. Shortridge. Presented to the National Museum by the Bombay Natural History Society. Twenty-three specimens.

This striking species is at once distinguishable from the other members of *Bandicota* by its smaller size and smaller teeth, and might, on account of its general resemblance to a *Gunomys* and its tendency to an increased number of mammæ, be quoted as a reason against my separation of the two genera from each other. But when placed among *Gunomys* skulls, as those of *B. savilei* actually were, a further and quite essential difference between the two genera becomes at once apparent, namely, that those of *Bandicota* are of a

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less fossorial type than those of *Gunomys*, as indicated by the longer nasals and normally set incisors (angle with molar tooth row 80°—90°*) as compared with the shortened nasals and forwardly projected incisors (angle over 95°) of the latter genus. In these respects, as also in its parasitic habits, *B. savilei* is absolutely a *Bandicota*, and does not show any real approach to the other genus.

The species is named after Mr. L. H. Savile, who was Honorary Treasurer of the Bombay Natural History Society for many years, and has taken great interest in the success of the Mammal Survey.

Passing to the *B. nemorivaga* group I may record that the British Museum contains examples referable to *nemorivaga* itself from Nepal (Hodgson and Manners-Smith), Calcutta (Blanford and Indian Museum), Khasia Hills (Blanford), Toungoo (Oates), Tengyueh, Western Yunnan (Howell), Southern Yunnan (Orii) and Formosa (Swinhoe).

With regard to the last named, Swinhoe suggested that the animal had probably been introduced artificially into the island, a suggestion supported by Mr. Wroughton, who has considerable knowledge of the way these animals are carried about in the Chinese rice boats, and also by my entire failure to find the slightest difference between the Formosan and Burmese specimens, great as is the geographical gap between them.

But the form found in Siam seems distinguishable and may be called

Bandicota mordax, sp. n.

Near *B. nemorivaga* but with larger teeth.

Size about as in *B. nemorivaga*, or, since the type is not full grown, perhaps averaging larger. Fur of the posterior back more profusely mixed with long blackish bristles, so that the colour is consequently darker than in *nemorivaga*. and the general appearance is more like that found in the *gigantea* group. Undersurface slaty grey, less broadly washed with whitish than in *nemorivaga*. Hands brown with whitish digits, feet wholly brown.

Skull apparently quite as in *nemorivaga*; supraorbital ridges not yet so developed in the type; palatal foramina narrowed posteriorly.

Molars large and heavy, their breadth markedly greater than in the allied species.

Dimensions of the type, measured in the flesh by Mr. Lyle:—Head and body 228 mm.; tail 230; hindfoot 52; ear 31. Skull:—Condylo-incisive length 55·3; zygomatic breadth 30; nasals 21 × 6·8; interorbital breadth 7·4; breadth between ridges on

* Taken as described Ann. Mag. N. H. September 1916, a modification of the method used in a previous number of this Journal.

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parietals 12·4; palatilar length 30; palatal foramina 11; upper molars series 10·8; breadth of m^1 3·8.

Hab.—Northern Siam. Type from Chieng-mai. Alt. 306 m.

Type.—Young adult female. B. M. No. 9.10.11.24. Original number 249. Collected 25th April 1908 and presented by Th. H. Lyle, Esq.

The breadth of the first molar in our considerable series of *B. nemorivaga* never exceeds 3·4 m.

(C) On the Rat known as *Epimys jerdoni* from Upper Burma.

By Oldfield Thomas.

For many years a spinous rat belonging to Bonhote's "jerdoni" group has been known from Upper Burma, and it has been provisionally assigned to Blyth's *Mus*, or *Epimys* (that is *Rattus**) *jerdoni*. Now however Wroughton has shown that *jerdoni* itself is a synonym of the earlier *fulvescens*, and I have therefore made a renewed examination of the Burmese species.

Although it is closely allied to other members of the same group, it appears to be distinct and requires a special name. I would propose to call it

Rattus mentosus, sp. n.

Most nearly allied to *R. confucianus*, M. Edw., but smaller; larger and with longer skull than *R. bukit*, Bonh. Fur profusely mixed with spines, at least in May, July and August specimens, probably less spinous in winter. General colour above greyish brown, suffused with buffy, the latter colour coming from the tips of the soft hairs, which are worn and at a minimum in the specimens available; probably in winter the whole upper surface is buffy, or at least greyish buffy. Undersurface pure sharply defined creamy or buffy white. Ears large, greyish, not contrasted with the head. Hands white, greyish down to the centre of the metacarpals; feet similarly with some grey on the metatarsals, white on the digits, but in some specimens the feet are wholly whitish. Tail long, rather coarsely scaled (10 rings to the centimeter), thinly haired, not pencilled, greyish brown above, white below, the white occasionally trespassing a little on the tip above. Mammæ 2—2=8.

Skull shaped much as in *confucianus*, but larger. Supraorbital bead strongly developed, projecting upwards, continued across the parietals to their posterior third. Zygomatic plate little projected forwards. Palatal foramina of medium length, wide and well open. Bullæ small.

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* *Cf.* Hollister, P. Biol. Soc., Washington, XXIX, p. 126, 1916. In future the word *Epimys* must be replaced by *Rattus*.

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Molars larger than those of *R. confucianus*.

Dimensions of the type, measured in the flesh:—Head and body 155 mm.; tail 196; hindfoot 32; ear 23·5. Skull:—Greatest length 39·3; condylo-incisive length 35·8; zygomatic breadth 17; nasals 14·8; interorbital breadth 5·2; breadth between parietal ridges 14·2; palatilar length 17·2; palatal foramina 7·2 × 3·2; upper molar series 6·3.

Hab.—Upper Burma. Type from Hkampti, Upper Chindwin. Alt. 500′. Also obtained in the Chin Hills by Mr. Mackenzie.

Type.—Adult male. B. M. No. 15.5.232. Collected 4th August 1914 by G. C. Shortridge. Presented to the National Museum by the Bombay Natural History Society.

(*D*) The Squirrels of the *Funambulus palmarum-tristriatus* Group in the Peninsula.

By R. C. Wroughton.

The allied Squirrels of Ceylon were recently dealt with in this Journal (Vol. XXIV, p. 37). Though even now these Squirrels are far from fully represented in our Collections, except from certain localities, it seems to me worth while under present circumstances to place on record the results obtained by the Survey so far as it has gone.

It seems probable that *F. palmarum* is a semi-parasitic form in the dwellings of man, while *tristriatus* is the wild form of the jungles. The distinction however is by no means strongly marked.

So far as our material goes *tristriatus* seems to be limited to the zone of moist heavy forests along the West Coast, from North to South. *F. palmarum* (with its allies) is found over the whole Peninsula (the Himalayas only excepted) from the extreme South to as far North as 24 N. Lat. (approximately). North of this it is replaced by *F. pennanti*, from which it is easily distinguishable by the bright buffy colouring of the underside of the tail, and by the presence of only three pale dorsal stripes.

Some years ago (Vol. XVI., p. 406, 1905) I published in this Journal, a paper on *F. palmarum*, L., and established a subspecies, *comorinus*, from Travancore, after fixing, for reasons given, the type locality of *palmarum* as Madras.

Since then the Museum has received a series of specimens from Madras, from Mr. E. Thurston, which may be taken to represent typical *palmarum* (from which the subspecies *comorinus* differs by its darker colour, and especially darker feet). With the new material made available by the Survey, it has been found possible to differentiate three new forms.

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On the whole *palmarum* and its allies do not seem to make so complete a second change of colour as *tristriatus*, and this, if there is any truth in the theory of the parasitism of *palmarum* is perhaps not to be wondered at.

The type, and a series from Travancore, of *tristriatus* have been in the National Collection for many years, but more recently Miss Ryley established, on Survey material (Vol. XXII., p. 437, 1913), a splendid new species, which she did me the honour to name after myself, to this I am now able to add another form, from Helwak, on the Satara Ghats. As the specimens from Kanara, however, seem to be intermediate I have ranked the Helwak form as a subspecies of *tristriatus*.

May I here venture to appeal to members for series of these Squirrels from various localities. There is almost certainly at least one more distinct form of *tristriatus* to be found in the jungles of Thana and northwards, and it would be a great thing to fill up some of the blanks between Mysore, Hoshangabad, and Hazaribagh in the distribution of the members of the *palmarum* section of the Group.

The following is a Key to the forms which I now recognise :—

KEY.

A. Skull 42 mm. or more.
- *a.* Size large, skull 48 mm., hindfoot 45 mm. (Coorg) ... ... *F. wroughtoni*, Ryley.
- *b.* Size medium, skull 44 mm., hindfoot 40 mm. (Travancore) ... *F. tristriatus*, Waterhouse.
- *c.* Size small, skull 42 mm., hindfoot 36 mm. (Satara Ghats) ... *F. tristriatus numarius*, subsp. nov.

B. Skull 40 mm. or less.
- *a.* Size larger, head and body 160 mm. or more, hindfoot 40 mm. or more.
  - *a.* Whole ground colour suffused with yellow or buff.
    - *a.* General colour paler. Feet almost white (Madras) ... *F. palmarum*, L.
    - *b.* General colour darker. Feet like the body (Travancore). *F. palmarum comorinus*, Wroughton.
  - *b.* No yellow suffusion on shoulders and flanks. Feet white (Bellary) ... ... *F. palmarum bellaricus*, subsp. nov.

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b. Size smaller, head and body rarely more than 145 mm., hindfoot 37 mm. or less.
  a. Teeth small, 6·3 mm. General colour a dark grey grizzle (Central Provinces, Nimar and the Berars) ... ... *F. robertsoni*, sp. n.
  b. Teeth larger, 6·7 mm., General colour paler, a yellow suffusion on the flanks (Bengal) ... *F. bengalensis*, sp. n.

The following are descriptions of the new forms:—

Funambulus tristriatus numarius, subsp. nov.

A local race of *F. tristriatus*, slightly smaller in all dimensions.

Fur as in true *tristriatus*. General ground colour above a grizzle of black and buff, giving a general effect of yellowish "drab" approaching "isabella colour," the "saddle" (extending from the shoulders to the rump) darker, a mixture of black and orange, with three longitudinal pale buff lines, broader and better marked than in true *tristriatus*. Face coloured like the back, with a yellow suffusion, cheeks buff. In the summer coat the ground colour of the saddle becomes jet black, and the dorsal stripes tend to become white, while the yellowish suffusion on the face becomes "tawny" and the cheeks more ochraceous. Below dull white except the anal region, which, like the under-side of the tail, is a bright "cinnamon rufous"; above the tail-hairs are black with white tips, arranged so as to indicate a black and white barring of the tail. Feet coloured like the ground colour of the body, but the grizzling much finer.

Skull rather smaller, but otherwise quite as in true *tristriatus*.

Dimensions of the type:—Head and body, 155; tail, 135; hindfoot, 36; ear, 15. Skull:—Greatest length, 42 (44); condylo-incisive length, 38 (40); zygomatic breadth, 24 (24); interorbital breadth, 13·5 (14); nasals, 12·5 (14·5); basilar length, 33·5; palatilar length, 18·5 (20); upper molar tooth row, exclusive of p^3 7 (7·5); diastema, 10 (10).

Hab.—Western Ghats of Bombay. (Type from Helwak, Satara District.)

Type.—Adult male. B. M. No. 15.7.3.26. Original number 24. Collected on the 7th December, 1914, by Mr. S. H. Prater and presented to the National Collection by the Bombay Natural History Society.

Mr. Prater obtained 32 specimens. Some are in summer and some in winter pelage, while others are in all stages of transition.

Mr. Shortridge obtained 35 specimens in Dharwar and Kanara which are clearly intermediates between this form and *tristriatus* but

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as they approach more nearly to the present form they may be reckoned as *F. t. numarius*.

The figures in brackets are those of the type of *F. tristriatus*.

Funambulus palmarum bellaricus, subsp. nov.

A *Funambulus* the size of *F. palmarum*, of which it is a local form, and from which it differs in the complete absence of yellow suffusion on the forearms, shoulders, and thighs.

General colour above rather a coarse grizzle of black and white, giving the effect of pale "smoke grey." The whole dorsal area forming a "saddle", which is coloured much darker, varying from dark "russet" to "seal brown", according to the season, the individual hairs ringed brown or black and cream buff. The usual three longitudinal dorsal stripes creamy white. The face more or less suffused with ochraceous, according to season. Feet and hands pale, nearly as in true *palmarum*. Tail black and white, very indistinctly barred, below "orange rufous". (The individual hairs are orange rufous at their base, paling to white, with two black rings, a narrower near the base, and a broader (4-5 mm.), below the white tip.

Dimensions of the type:—Head and body, 168; tail, 156; hind-foot, 41; ear, 16. Skull:—Greatest length, 40 (41); condylo-incisive length, 36 (36); interorbital breadth, 13 (13); nasals, 12 (10); basilar length, 31 (32); palatilar length, 17·5 (17); upper molar tooth row, except p^3, 6·6 (7); diastema, 10 (9).

Hab.—Bellary and Southern Mahratha Country. (Type from Vizayanagar).

Type.—Adult male. B. M. No. 13.4.10.39. Original number 1363. Collected by Mr. Shortridge on the 20th July 1912. Presented to the National Collection by the Bombay Natural History Society.

Mr. Shortridge obtained 13 specimens in Bellary, and 21 in Dharwar, which may all be referred to this local race. He also obtained 29 specimens in South Mysore, which must be considered as intermediates, some of them approaching *bellaricus* and some true *palmarum*.

The figures in brackets are those of an adult ♀ *F. palmarum* from Madras.

Funambulus robertsoni, sp. n.

A sombre coloured *Funambulus*, markedly smaller than *palmarum*.

General colour above a coarse grizzle of black and "cream buff" giving the effect of "hair brown" (individual hairs white with black rings and a black tip). The saddle brown, with a slight

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yellow tinge, due to the admixture of yellow hairs, getting darker at certain seasons. The dorsal stripes buffy white. The face coloured like the shoulders and thighs, but suffused with ochraceous in some specimens (not in the type). Below, in most cases, "vinaceous cinnamon", in some dull white. The tail "vinaceous rufous" below, mixed black and white above, the appearance of bars practically absent. Feet same as general colour but rather paler.

Skull usually smaller than in *palmarum* (that of type, an old animal, exceptionally large).

Dimensions of type:—Head and body, 140 mm; tail, 146; hindfoot, 37; ear, 17. Skull:—Greatest length, 39·5; condylo-incisive length, 37; interorbital breadth, 13; nasals, 11; basilar length, 31·5; palatilar length, 17·5; upper molar tooth row, except p^3, 6·3; diastema, 9·5.

Hab.—Central Provinces, Nimar, and the Berars. (Type from Pachmarhi.)

Type.—Old male. B. M. No. 12.11.29.92. Original number 1021. Collected by Mr. Crump on 20th March 1912. Presented to the National Collection by the Bombay Natural History Society.

Mr. Crump obtained 22 specimens in the Central Provinces besides a dozen in Nimar and the Berars.

I have much pleasure in naming this pretty little species after Mr. Laurence Robertson, C.S.I., I.C.S., at present Honorary Treasurer of the Society, who takes a close interest in the work of the Survey, and who was able to render Mr. Crump much assistance when the latter visited his District (Junagadh).

Funambulus bengalensis, sp. n.

A *Funambulus* resembling *robertsoni* in its small size, but distinguishable by its much larger teeth and the presence of an ochraceous tinge on the flanks.

Size as in *robertsoni*. General ground colour above a finer grizzle than in that species, and markedly paler. A distinct, pinkish buff, coloration on the flanks (not present in *robertsoni*). Below invariably dull white.

Skull as in *robertsoni*, but with distinctly larger teeth.

Dimensions of the type:—Head and body, 140; tail, 146; hindfoot, 36; ear, 15. Skull:—Greatest length, 37; condylo-incisive length, 34; inter-orbital breadth, 12; nasals, 10; basilar length, 30; palatilar length, 16·5; upper molar tooth row (except p^3), 6·7; diastema, 8·5.

Hab.—Bengal. (Type from Hazaribagh.)

Type.—Adult female. B. M. No. 15.4.3.77. Original number 4880. Collected by Mr. Crump on 10th May 1914. Presented to the National Collection by the Bombay Natural History Society.

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Mr. Crump obtained 14 specimens belonging to this species. It is possible that the discovery hereafter of intergrading may require that it be treated as a subspecies, but in the complete absence of such at the present date, between it and either *palmarum* or *robertsoni*, I use a binomial name for it.

(*E*) The Indian Jackals.

By R. C. Wroughton.

Taking advantage of the temporary stoppage in the receipt of new Survey Collections for examination, I have laid out the whole of the jackals obtained to date by the Survey, amounting to some 140 specimens. From this splendid mass of material it is at once evident that there are two main "patterns," *viz.* :—a "variegated" and a "grizzled." The former occupies the greater part of the peninsula, a darker form, named *indicus*, by Hodgson, being found throughout Kumaon, Bengal and Sikkim, and most probably including the Burmese jackal; a paler form, found through Khandesh, Central Provinces, Cutch, Kathiawar, and Rajputana (and in which I provisionally include, pending receipt of material from Baluchistan and beyond, the Sind jackal), which I propose to separate as a subspecies of *indicus* under the name *kola*. The "grizzled" pattern is characteristic of the jackal of the West Coast from Bombay southwards to Cape Comorin. (I have seen no specimens from the East Coast), and this I propose to describe as a new species under the name *naria*. The Ceylon jackal, except perhaps in its slightly larger size, is almost indistinguishable externally from that from the adjoining coast of the Peninsula, but an examination of the skull shows that it possesses a tooth character which separates it sharply from all other Asiatic jackals. It has a supplementary, median internal rooted lobe or cusp on the third premolar, *i.e.*, on the tooth immediately in front of the carnassial, which is not present in any other species of Canis. To this form I propose to give the name *Canis lanka*.

In one of my earliest reports (Vol. XXI., p. 837), I put forward reasons for keeping the Indian jackal separate from *aureus*, L., from the Persian Gulf. I confess that now, writing with much more experience, I should write far more cautiously, for the fact is that our material for judging of the true *aureus* is practically negligible. Nevertheless I am still of the opinion that we may deal with the Indian jackal, provisionally at any rate, as distinct from *aureus*, especially as no harm can be done or confusion caused by following that course.

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The following is a key to the forms proposed :—

KEY.

A. General pattern variegated, *i.e.*, a pale ground colour irregularly splashed with black.
  a. Darker, ground colour "ochraceous buff" limbs "tawny" (Bengal, Kumaon, &c.)..... *C. indicus indicus*, Hodgson.
  b. Paler, ground colour "buff" or even "cream buff" limbs "ochraceous buff" (Khandesh, Kathiawar, &c.)..... ..... *C. indicus kola*, subsp. nov.

B. General pattern grizzled, *i.e.*, ground colour black, ticked with white.
  a. Larger, third upper premolar with a supplementary median-internal rooted lobe. (Ceylon) ..... *C. lanka*, sp. n.
  b. Smaller. no supplementary lobe on third upper premolar (West-Coast)..... *C. naria*, sp. n.

The following are descriptions of the various forms :—

Canis indicus, Hodgson.

Fur long, 60-70 mm. on the back, under-fur scanty.

General colour of the back "ochraceous buff", irregularly and coarsely splashed with black, the individual hairs black, with a subterminal, broad, "ochraceous buff" ring (15 mm. or more wide), the black tip 10 mm., under fur drab." Face dull tawny, with some admixture of black especially below the eyes. Tail coloured like back. Limbs tan or "tawny," feet paler. Chin and throat white, sides of throat ochraceous buff which extends, as a collar, downwards across the throat. Abdomen ochraceous like the flanks.

Dimensions of a rather old female from Lohra, Hazaribagh :— Head and body, 700 ; tail, 235 ; hindfoot, 147 ; ear, 75. Skull :— Greatest length, 856 ; condylo-basal length, 148 ; palatilar length, 73 ; zygomotic breadth, 82 ; back of molar tooth row to front of carnassial, 32 ; carnassial, 16 ; back of first molar to front of canine, 61.

The Survey has furnished 39 specimens of this form, *viz.* :— Sikkim, 10, Kumaon, 15, and Bengal Orissa, 14. Our material from Burma is meagre and bad, but I see no reason to doubt that the Burmese jackal is *C. indicus*.

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Canis indicus kola, subsp nov.

A pale race of *indicus* proper.

Fur and under fur as in *indicus*. The pattern of the back is as in *indicus*, an irregular splashing of black on the ground colour, but this latter is much paler, the rings on the individual hairs, which go to compose it, being at most a slightly buffy white. Limbs pale "ochraceous buff." Otherwise the colouring as in true *indicus*.

Dimensions of the type:—Head and body, 705; tail, 240; hindfoot, 156; ear, 70. Skull:—Greatest length, 156; condylo-basal length, 147; palatilar length, 75; zygomatic breadth, 83; back of molar tooth row to front of carnassial, 32; carnassial 16; back of first molar to front of canine, 60.

Hab.—Rajputana, Cutch, Kathiawar, Khandesh, Central Provinces, &c. Type from Palanpur.

Type.—Adult female. B. M. No. 16.4.16.12. Original number 3165. Collected by Mr. C. A. Crump on 22nd April 1913, and presented to the National Collection by the Bombay Natural History Society.

I have carefully compared nearly fifty specimens collected by Mr. Crump from the localities quoted above. There is some slight variation, *e.g.*, Rajputana specimens are tinged with yellow, &c., but on the whole the contrast with the black and tan colouring of true *indicus* is very striking. The Sind specimens, as was to be expected, approach very closely to this form, but on comparing them with a very old specimen from Seistan, I decided that it would be wiser to put them aside until we have material for comparison from Baluchistan and beyond.

Canis naria, sp. n.

A species about the same size as *indicus*, but differing entirely in its colour pattern, which is black and white grizzled. Fur of medium length (50 on the back), but little longer than the under-fur. General colour on the back a coarse grizzle of black and white (or a black ground colour ticked with white), the individual hairs black with a short subterminal ring (less than 10 mm.), and a black tip about the same length, on the flanks the black tips are shorter and white preponderates in the grizzle, face the same pattern as the back, but the grizzle very fine and becoming tinged with tawny anteriorly. Chin white, the colouring of the flanks and sides of throat extended downwards to form a collar. Behind the forelegs the colouring of the flanks extends downwards to the abdomen. The colouring of the flanks extends backwards over the thighs, below this the hindlegs (and the forelegs below the knee) are a bright tan.

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Dimensions of the type :—Head and body, 670 ; tail, 210 ; hindfoot, 140 ; ear, 77. Skull :—Greatest length, 148 ; condylo-basal length, 140 ; palatilar length, 68 ; zygomatic breadth, 81 ; back of molar tooth row to front of carnassial, 30 ; carnassial, 15·5 ; back of first molar to front of canine, 58.

Hab.—West Coast of Peninsula, from Bombay southwards. Type from Coorg.

Type.—Adult female. B. M. No. 16.4.16.31. Original number 2364. Collected by Mr. G. C. Shortridge on 23rd January 1913, and presented to the National Collection by the Bombay Natural History Society.

The Survey obtained altogether 23 specimens, from Ratnagiri, southwards through Kanara, Dharwar, and Mysore, to Coorg.

Canis lanka, sp. n.

A species outwardly resembling *C. naria*, but larger than that species and than any forms of *indicus*, and entirely differentiated from any other jackal by the primitive form of its third premolar.

Size large. Fur as in *C. naria*. Pattern and colouring almost exactly as in that species.

Skull large. The third premolar (*i.e.*, the tooth immediately in front of the carnassial) with a median internal rooted lobe, recalling strongly the similar lobe on its predecessor, the "milk" carnassial.

Dimensions of the type :—Head and body, 765 ; tail (damaged), 175 (in a somewhat smaller male the tail is 236) ; hindfoot, 161 ; ear, 75. Skull :—Greatest length, 177 ; condylo-basal length, 163 ; palatilar length, 80 ; zygomatic breadth, 91 ; back of molar tooth row to front of carnassial, 36 ; carnassial, 18 ; back of first molar to front of canine, 68 ; weight 191 lbs.

Hab.—Ceylon. Type from Mankeni. E. P.

Type.—Adult male. B. M. No. 16.4.16.21. Original number 506. Collected by Major E. W. Mayor on the 3rd September 1913, and presented to the National Collection by the Bombay Natural History Society.

Major Mayor obtained six specimens (of which one is immature). The five adult specimens all show this peculiar formation of the third upper premolar, as also does an old female skull in the National Collection presented by Mr. Whyte. On the other hand I have examined over 100 skulls, including a few of wolves, foxes, and African jackals and have found no trace of a similar character in any one of them. H. Winge, in his work, "Rovdyr (Carnivora) fra Lagoa Santa ; in "E Museo Lundii", 1895, p. 100, records it as present in certain very primitive fossil carnivora, and it is not rarely present in the Viverrines, *e.g.*, *Genetta*, *Helogale*, &c., but I can hear of no case of its having been found in any of the *Canidæ* or even among their close relatives.

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Since the above was written Mr. R. I. Pocock has informed me that in some skulls in his possession he has found a similar formation of the teeth (but on one side of the jaw only) in skulls of *Canis naria* and *Canis lupaster*, the former shot by Major Rodon at Dharwar, and the latter from Africa. He tells me that he has also found it in the Greyhound. This does not of course affect in any way the validity of *lanka* as a good species, but in any speculation as to whether this peculiar tooth formation is (1) a Survival, (2) a Revival or (3) a New departure, Mr. Pocock's facts cannot but be of very considerable interest.

(*F*) The Langurs of Assam.

By R. C. Wroughton.

When describing the *Presbytis shortridgei* of the Upper Chindwin, Journ. B. N. H. S., Vol. XXIV, p. 56, I found a considerable amount of confusion existing as to the nomenclature of the Langurs of Assam and determined to return to them when leisure allowed. On laying out the material available in the National Collection I find that there are two quite distinct species representing Lower and Upper Assam respectively. Blanford records *pileatus* Blyth as the name of the Assam Langur, and his description is sufficiently wide to cover both the species I have mentioned above, but on referring to Blyth's original description it seems that the author of the name, who states that his specimen type was half grown, was under the idea that his specimen was Malayan and describes it as of the *obscurus* type. However the recent transfer of the generic name *Pithecus* to the Langurs makes *pileatus* invalid in that genus, as the name *Pithecus pileatus* had already been used for a macacque. There remains the name *chrysogaster* stated by its author to have come from Tenasserim, but which Blanford hints probably came from Cachar (Mammalia, p. 38, footnote). Here again however the matter is of no moment for when the name was first published by Peters it was so as synonymous with *potenziani*, a totally distinct animal. It would appear therefore that there is no existing valid name for these Assam Langurs, with which, for convenience, I associate *shortridgei*, as being closely related, although living just beyond the actual boundary of Assam. The three species may be arranged in a key as follows:—

Key.

General colour cinereus.

A. Whiskers only slightly paler than the general body colour; under surface like general colour (Upper Chindwin River)... ... *shortridgei*, Wr.

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B. General colour cinereus, whiskers pure white; under surface greyish white on the chest, buff on the belly. (Lakhimpur, Upper Assam) ... ... *brahma*, sp. n.

C. General colour dusky brown; whiskers under surface ochraceous. (Cachar and Lower Assam) ... ... *durga*, sp. n.

Pithecus shortridgei, Wr.

I described this species so recently in this Journal (l.c.) that a repetition is unnecessary here. I would however take this opportunity of recording that it has been suggested, especially by Mr. Shortridge, that the modified colouring of my subspecies *belliger* from Hkamti is due to wood smoke. The type of *shortridgei* is from Homalin.

Pithecus brahma, sp. n.

A Langur resembling *shortridgei*, but at once recognisable by its snow white whiskers.

Size and fur as in *shortridgei*; the head, shoulders and forearms coloured cinereous quite as in *shortridgei*; the lower back and flanks modified by a buffy mixture to an indescribable smoky brown colour. Tail very much as in *shortridgei*; cheeks and whiskers, which include the ears, snow white. Below the chest, throat and chin whitish, the belly and especially the flanks buff or ochraceous buff. Tail as in *shortridgei*, *i.e.*, a few inches at the base like the back and the rest black.

Skull as in *shortridgei*, but all measurements smaller because it is a less well developed animal, the teeth too appear to be slighter though the length of the row scarcely differs from that in the type of *shortridgei*.

Dimensions of the type unfortunately are not recorded but the measurement of the foot is about 190 mm. and I judge the other body dimensions are very much as in *shortridgei*.

Skull:—Greatest length, 110; basal length, 77; zygomatic breadth, 59; breadth across orbits, 69; interorbital breadth, 10; cheek teeth, behind the canine, 29.

Habitat.—Lakhimpur, Upper Assam.

Type.—Adult male B. M. No. 13.2.21.1. Original number 1416. Collected by Mr. Stevens on 23rd November 1911.

Though intermediate in its general colouring between *shortridgei* and *durga* the striking snow white whiskers of *brahma* separate it sharply from both.

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Pithecus durga, sp. n.

A large Langur resembling *shortridgei* and *brahma*, but recognisable by its browner general colour and ochraceous whiskers and under surface.

Size and fur as in *shortridgei* and *brahma*.

General colour yellowish drab above, whiskers and whole under surface ochraceous (there are small spots of paler colouring on the ears and temples). Tail as in the other two species.

Skull quite as in *shortridgei*.

The body dimensions of the type are unfortunately not recorded, but as the hind foot measures 190 mm. the other dimensions are probably much as in *shortridgei*.

Skull.—Greatest length, 117; basal length, 84; zygomatic breadth, 87; braincase breadth, 65; breadth across orbits, 75; interorbital breadth, 11; cheek teeth, behind the canines, 30.

Habitat.—The original entry on the label was 'Cachar' which has been altered to 'Upper Assam'. A second specimen is labelled Assam, while a third is marked 'Silhet'. I feel convinced that the 'Upper Assam' on the type label is incorrect and that *durga* is the Langur of Lower Assam.

Type.—Adult male, B. M. No. 86.10.18.1. Presented to the National Collection by Dr. Reid.

If Blyth's *pileatus* was an Assam, and not a Malayan animal, as he thought, it probably was this species, but as I have already said the name is now invalid in the genus.

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THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

(INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

(*Continued from page 497 of Vol. XXIII.*)

PART XVIII.

The classification of the family given by Colonel Bingham in his Butterflies of the Fauna of British India series for all the insects occurring within India limits is as under:—

A.—Legs abnormal; either tibiæ or tarsi peculiar or elongated .. .. *Gerydinæ.*

B.—Legs normal as described for the family.

a. Fore wing: veins 5 and 6 approximate at base or 6 out of 7 beyond apex of cell.

a^1. Fore wing: vein 11 anastomosed with vein 12 .. .. *Poritiinæ.*

b^1. Fore wing: vein 11 not anastomosed with vein 12 .. .. *Arhopalinæ.*

b. Fore wing: veins 5 and 6 not approximate at base.

a^1. Fore wing: vein 7 terminating at or before apex of wing on costal margin.

a^2. Hind wing: without lobe .. .. *Lycæninæ.*

b^2. Hind wing: lobate or sublobate.. .. *Theclinæ.*

b^1. Fore wing: vein 6 terminating after apex of wing on terminal margin.

a^2. Fore wing: vein 8 absent.. .. .. *Curetinæ.*

b^2. Fore wing: vein 8 present .. .. *Liphyrinæ.*

In this key there are three sub-families which do not concern us. These are *Gerydinæ, Poritiinæ* and *Liphyrinæ.* Recasting it to suit our requirements, we get:—

A.—Fore wing: veins 5 and 6 approximate at base or 6 out of 7 beyond apex of cell and vein 11 not anastomosed with 12 .. .. *Arhopalinæ.*

B.—Fore wing: veins 5 and 6 not approximate at base.

a. Fore wing: vein 7 terminating at or before apex of wing on costal margin.

a^1. Hind wing: without lobe .. .. .. *Lycæninæ.*

b^1. Hind wing: lobate or sublobate .. .. *Theclinæ.*

b. Fore wing: vein 7 terminating after apex of wing on terminal margin and vein 8 absent .. *Curetinæ.*

In the above adapted key there will not be much difficulty in finding out whether vein 5 and 6 of the forewing are or are not approximated at their

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bases; or whether vein 7 terminates on the costal margin, at apex or on the terminal margin. The separation of *Lycæninæ* from *Theclinæ* by the simple character of the lobe or absence thereof in the hind wing is perfectly easy.

In accordance with this key our 72 species will be arranged in the following order:—

Lycæninæ:—

Genera—*Neopithecops*, *Spalgis*, *Megisba*, *Lycænopsis*, *Zizera*, *Azanus*, *Chilades*, *Talicada*, *Lycænesthes*, *Everes*, *Nacaduba*, *Jamides*, *Catochrysops*, *Tarucus*, *Castalius*, *Lampides*.

Curetines:—

Genus—*Curetis*.

Arhopalinæ:—

Genera—*Iraota*, *Surendra*, *Mahathala*, *Amblypodia*, *Arhopala*, *Zezius*, *Creon*, *Pratapa*, *Tajuria*, *Chliaria*, *Thaduka*, *Zeltus*, *Rathinda*, *Catapœcilma*, *Horaga*, *Loxura*, *Deudorix*, *Cheritra*, *Bindahara*, *Virachola*.

Theclinæ:—

Genus—*Aphnæus*.

The eggs of these sub-families are as follows:—

Lycæninæ.—Turban-shaped, the diameter twice the height; the surface covered with reticulations which are more or less raised and fine or coarse, forming a net work of little irregularly hexagonal cells. At the intersections of the lines there are slight thickenings. The colour is generally greenish with the raised lines and thickenings pure white. The top and bottom of the egg is, as a general rule, flat but, in some of the genera (*Chilades*, *Talicada*, *Lycænesthes*, *Tarucus*, *&c.*), it is more or less depressed.

Curetinæ.—A depressed sphere, shaped like a sea-urchin and covered with coarse, hexagonal reticulations; the apex of the egg with a deep, central depression.

Arhopalinæ.—The eggs are dome-shaped, broader than high and are always covered with hexagonal, coarse reticulations which, at the intersections of the lines, are thickened or produced into little points which, in some species, are jagged or set with tiny points at their ends.

Theclinæ.—Rather flatly dome-shaped and covered with coarse or fine, raised reticulations with thickenings at the intersections. The reticulation is more or less regular and there are, in *Aphnæus vulcanus* and *A. hypargyrus*, 6 rows of cells from top to base and the centre of apex, where the micropyle is situated, is somewhat deeply depressed forming a small circular pit.

The difference in the colouring of the upper sides on the wings in the sexes of some of the species is sometimes very great as, for example, in *Curetis* where the male is copper and the female white, both bordered with black, the former much more narrowly than the latter. In *Chrysomallus* the male is brownish-red with a violet gloss, the female is light-blue with a broad, suffused, brown border. The male of *Bindahara* is deep velvet-black with

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a short band of metallic blue above the base of the tail on the hind wing whereas the female is brown. The great majority of the males are some shade of blue on the upper side, metallic or otherwise, varying from deep smalt or cobalt to light metallic azure; the females are always of lighter colour and generally without any metallic sheen. On the underside the colour is white, grey, brown, fawn, &c., but never black or blue although there is sometimes a blue gloss; this ground-colour being either pure with dark border or crossed by fine lines of black or bands and lines of white: there is generally a spot of black near the anal angle of the hind wing and this spot is often crowned with ochreous or silver; sometimes there are two such spots. The *Camena-Ops-Tajuria* group have the undersides of a pure grey or brown; *Camena argentea* (not in the key given above) is silver, like a new rupee in the male, pure grey with, sometimes, a pinkish shade in the female; all have a fine, black line or two inside and parallel to the outer margin. The *Nacaduba* and *Arhopala* lot have broken, parallel bands formed by white lines enclosing strips of the ground colour; *Castalius* is white with black spots as is also *Cyaniris*; *Tarucus* is white or yellowish with black bands and spots arranged in rows; *Catochryshops* is pure grey or whitish with bands and spots, &c., &c. The colour on the upperside may vary slightly with the season according as to whether it is wet or dry or according to whether it is hot or cold. This variation generally affecting the shade or the amount of black in the border. The underside is often equally affected in the same way and the arrangement of the markings is then seemingly changed so that a cold-weather specimen of a species may present quite a different aspect at first sight to a hot-weather one, as in *Everes argiades* and *Nacaduba pandava*. The shape of the wing is rarely affected by this seasonal dimorphism as it is in some of the *Satyrinae* and *Nymphalinae*. The wings are often tailed or lobed, or both, the tails sometimes exceeding or equalling in length the breadth of the hind wing to which it is attached; sometimes, in this case, it is quite broad, and curled, or twisted; but, generally, it is short, thin and thread-like. When there is a lobe, it is situated at the anal angle and is more or less semicircular in shape and of a different colour to the rest of the wing; above it is often black, below it bears a deep, black, central spot; it is always in a different plane to the rest of the wing so that, when the insect is at rest, with the wings brought together over the back, it stands out more or less at right angles to the general surface. To the upper, outer edge of this lobe is sometimes attached a thread-like tail which is generally slightly twisted, black in colour and white-tipped and waves about in the wind. When the wings are brought together over the back in a position of rest, they are generally rubbed together with a gentle up and down motion by their possessors. The lobes, thus brought together, of course take part in this motion and, to the eye of an observer situated behind and on the same level as an insect at rest on a leaf, bear the most startling likeness to the head of a *Mantis* with its prominent eyes and short antennæ, the former moving from side to side with an added gyratory motion, the latter held erect and slightly agitated. The resemblance *should* be protective if it is not. Granting that ants and other small predatory insects are able to see as well as recognize their enemies, it should certainly serve some such purpose for the *Mantis* preys regularly upon any insect it can catch and overpower. Mr. T. Bainbrigge Fletcher has alluded to these lobes in his recent book "Some South Indian Insects,' instancing the genera *Virachola* and *Aphnæus*. But he considers that they are a protection against larger enemies such as birds and lizards because, he says, they are, with their tails or appendages, so like the head of the butterfly that they mislead attackers and so save the vital parts.

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In the classification of the genera given above these tails and lobes to the hind wings have been used as the chief character and, for the purpose of the limited number of insects with which it deals, they answer very well. It will be noticed, however, that, even here, it is not absolutely exclusive; that is, it will be seen that, even in the same species, some specimens may be tailed while others are not (*Nacaduba*) and, in *Surendra*, the male differs from the female in the contour of the hind wing.

The shape of the wings of the *Lycænidæ*, it has been said above, is not, except very rarely, affected by seasonal dimorphism. Apparently it occurs only in the genera *Curetis* and *Loxura* and, in the former, only to a slight degree, if *thetis* and *bulis* are really specifically distinct. In *Loxura* the wet-season form *atymus* is very dark, with a long tail to the hind wing; in the dry season the colour is bright golden yellow-orange with the black bordering much more feebly expressed, the tail shorter and the outer margin of the fore wing nearly quite straight. The term "wet-season" should really be "season of young, succulent shoots," the "dry-season" should be "season when the sap of plants is more or less inactive or only feebly active" as has been remarked before in these papers.

There are said to be some 2,000 species of the family known in the whole world. The number found in British India, Ceylon and Burma is about 460, of which some 70 odd are found in the Bombay Presidency. The number treated of in these papers is 72, some few of which do not exist in the Presidency but are found in the Plains of other parts of India.

In the British isles there are 18 species of Blues, Hairstreaks and Coppers, of which two: *Lampides bæticus* and *Everes argiades* extend to India and are found everywhere. *Cyaniris* is a genus also common to England and India though the solitary representative at home, the Holly Blue, is not found here.

The *Lycænidæ* are generally easily distinguished from the members of other families by their general appearance. The perfect insect is, as a rule, small or moderate in size, of characteristic shape, flies well and generally not high up, is fond of sunlight and flowers and rarely stays long on the wing at one time. They often come to water or moisture on the ground and are generally not too easy to see because of the somewhat cryptic colouring of the underside of the wings which are closed on settling and blend well with their surroundings.

The egg is characteristic of the family, being generally sculptured or reticulated on the surface with fine, raised lines or ridges forming little cells or areoles. The cells are often irregular being six—or fewer—sided or nearly circular according as the raised lines are finer or coarser. It is generally either turban-shaped, the bottom flat (where it is attached upon being laid), the top very nearly flat and sometimes concave, the sides slightly convex; or dome-shaped. The breadth is nearly always greater than the height, though sometimes not by very much and the diameter of the extreme base is hardly ever different from that of the extreme top though it is stated by Mr. Doherty (J. A. S. B. 1889, p. 409), as mentioned by Colonel Bingham in his Butterflies of the Fauna of British India series, that the egg of that largest of lycænids, *Lyphyra brassolis*, Westwood, is broader at bottom than at top, and Doherty also states that the egg of the *Poritiinæ* is "hexahedral." But neither of these sub-families interest us here. He does not mention the size of the egg of *Lyphyra* in exact measurement but states that it is "of great size". As a general rule lycænid eggs are rather small and the breadth, the greatest measurement, rarely reaches one millimetre. The colour is generally light green but this is often obscured by the overlying white reticulations

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and there are often little knobs and even spine-like excrescences at the junctions of the lines. As a very general rule all *lycænid* eggs are laid singly but there are exceptions. *Amblypodia anita*, for example, and *Lycænesthes emolus* lays them in groups, but always side by side, never one over the other as does the papilionine *Papilio demolion*, race *liomedon*, Moore. The situation chosen for oviposition varies according to the habits of the species. It is generally a flower or its stalk, often a young shoot and then the egg is placed in the axil of a leaf or flower-bud; wherever it is, it is nearly always well concealed. Some species are content to lay on dead twigs and even on the ground on dead leaves in the vicinity of the food-plant. In the case of larvæ living in the interior of fruits it is deposited nearly invariably on the flower before the fruit forms. The species whose larvæ are attended by ants are the least particular as to the position and very often choose a bare leaf-surface or even the surface of some foreign substance that may happen to be convenient. The ants then find out where it is and seem often to visit it regularly until the eclosion of the little larva which they have been seen to carry away and place in some spot which, presumably, they take to be safer and better for its health. *Surendra quercetorum* has been observed to lay its eggs actually among the ants (*Cremastogaster* in this particular case) without being in any way molested by them. Although the butterfly stood up high on its legs during the process, they seemed to be quite friendly and stroked its tarsi with their antennæ without causing the slightest alarm.

It would probably be possible, within somewhat broad limits, to classify the *Lycænidæ* a little further than has already been done above according to the shape and sculpture of the egg but, for the purpose of the present papers, it could not be of any interest, the number of species dealt with being very small; and the egg unknown, even, for some of them. It will be described for each one, as far as information is available, further on under the life histories.

The larvæ are also characteristic of the family. It is only in the *Erycinidæ* that there is anything resembling them amongst the butterflies and, among the moths, there are some of the caterpillars of *Limacodidæ* and *Zygænidæ* which might possibly be mistaken for them. The former moth-larvæ can, however, be immediately recognised by the fact that they only possess ventral mammellæ instead of prolegs, the latter by their possessing rows of dorsal warts or tubercles somewhat resembling those of the caterpillars of *Aphnæus*—these warts are, however, more conical in the moth-larva, while in theother they are tooth-like.

The general type of the caterpillar is like a woodlouse in shape in that it is somewhat semi-circular in transverse section, broadest in the middle or in front of it and tapering more or less to both ends. The head is hidden under the somewhat hood-like second segment, the third segment, again, is generally higher than the second and overhangs it so to speak. The tail-end of the body is nearly always more or less rounded, rarely tailed as in *Chliaria othona* where there are two, small, well-separated, tail-points. The segments are well marked except those at the anal end: segments 12 to 14, which are always difficult to distinguish one from the other. These are generally inclined gently in the dorsal line but, in *Bindhara*, *Deudorix* and *Virachola* where the larvæ feed in the insides of fruits, they are highly sloping and together form a sort of flat, circular stopper for the hole of ingress and egress and are used for cleaning out the galleries, that is, ejecting the excrementaceous matter from them. The head is always comparatively small for all species, the spiracles are always above the dorsoventral line, the surface is generally clothed with minute hairs which are often delated at the top or star-shaped; sometimes it is practically

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smooth, in a few cases there are long fleshy teeth along the dorsal line and occasionally, on the dorsoventral margin also. The shape is liable to variation, in that the oval form is sometimes constricted or narrowed into a waist about segments 7-10 (*Amblypodia, Tajuria cippus*) and, then, also, the body is lowered in the same region. In most cases there are secondary organs on segments 11 and 12; those on the latter being little, white, cylindrical tubes that can be protruded and withdrawn at pleasure and seem to serve as signal-towers to attract the attention of the ants that generally are found with the larvæ. These organs are situated near the spiracles. In *Curetis* they are permanently exserted and coloured like the rest of the skin—but this is the only species in which they are very long; *Aphnæus* has them also exserted but short. The organ on segment 11—there is only one—is dorsal and central, consisting of a transverse, mouth-shaped, generally slightly thick-margined gland which exudes a sweet fluid of which the ants are evidently fond as they stroke it with their antennæ to excite production of the honey and then lap it up with avidity. Some of the caterpillars, that is those of some species, do not seem to have any gland at all, as, for example, *Curetis* where, if it does exist, it is certainly not active and ants do not seem ever to pay it any attention in consequence. In this last case the towers are supposed to be organs of defence or protection, for the larva can throw out from them a brush of long hairs which it flourishes round and round quite a number of times when disturbed, and then suddenly withdraws. All the hairs in the brush separate in the process.

As regards the pupæ or chrysalides, there are three very distinct types. In two of them, characterising the sub-familes *Lycæninæ*, part of the *Arhopalinæ* and *Theclinæ*, the shape is normal as shown in figures 21*a*, 22*a*, 23*a* and 24*a* of Plate II; although, here, too, there are differences in individual facies, some being much stouter than others, some rather narrow for their length and so on. The genera in the *Arhopalinæ* that have it normal are *Surendra, Arhopala, Zezius, Chliaria, Thaduka, Catapæcilma, Loxura, Deudorix, Bindhara, Virachola* and, probably, *Mahathala*. The normal pupa is always attached by the tail and has a tight band over segment 5 attached to the surface on which pupation takes place on either side. The second type belongs to *Curetis* and is depicted also on Plate II, figure 28*a*. Here the shape is nearly quite hemispherical with the whole ventral surface quite flat; and the pupa is attached only by the tail although, in some cases, there are signs of a body-band. The third kind is confined to the arhopaline genera *Creon, Pratapa, Tajuria, Rathinda, Cheritra* and, perhaps, *Horaga* and *Zeltus*. In this case the shape is that of figures 25*a*, 26*a* and 27*a* and there is no vestige of a body-band, the chrysalis standing free on its tail.

There is one character common to all the arhopaline pupæ which can be used to distinguish them from the lycænine ones and that is the shape of the last segments of the abdomen. In the former the last segment is dilated in the form of a horse's hoof round the under circumference of which are fixed the suspensory hooklets; in the latter there is no such widening.

A key might therefore be made as under:—

A.—Last segment of abdomen more or less dilated and resembling somewhat a horse's hoof.

a. Shape abnormal.

a^1 Outline more or less circular with the ventral surface absolutely and completely flattened .. .. *Curetinæ.*

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b[1]. Outline not extremely abnormal but the whole body curved, the thoracic portion being bent down from the abdominal part .. .. *Arhopalinæ* part, embracing the genera *Pratapa*, *Creon Ops*, *Tajuria*, *Rathinda*, *Cheritra* and, perhaps, also *Horaga* and *Zeltus*.

b. Shape normal .. .. *Arhopalinæ* part, embracing *Surendra*, *Arhopala*, *Zezius*, *Chliaria*, *Thaduka*, *Catapœcilma*, *Loxura*, *Deudorix*, *Bindahara*, *Virachola* and, probably, *Mahathala*. *Theclinæ* as represented by the genus *Aphnæus* as far as is known.

B.—Last segment not dilated in any way.. *Lycæninæ*

There is little use in pursuing this pupal classification any further. Each one will be described accurately in the subsequent life-histories of the insects concerned.

A classification of the larvæ will be much more interesting but, of course, it can only be based on the mature stage. The earlier stages tare somewhat different from the full-grown ones in many cases, chiefly in the nature of the clothing of hairs, &c., though the shape, seemingly, never varies for the same species. Many egg-caterpillars are born with simple hairs which they afterwards may lose and none of them ever seem to possess the star-shaped, flattened, disc-topped, &c., hairs that characterise the mature specimens. The differentiation is best, in the first place, based on the shape, secondly on the covering of the body in the way of hairs, &c. The colour is, as a rule, very variable in the same species, in that the greens are very liable to become brown, rose, or red according to the colour of the vegetable matter consumed; green leaves, white flowers, red shoots and so on. There are, however, larvæ the colour of which always remains fairly constant as, for example, those of *Amblypodia anita*, *Ops*, *Creon*, *Bindahara*, *Virachola*, *&c.* The pattern hardly ever varies.

As regards the general shape it is, as before mentioned, more or less that of a wood-louse normally and this characterizes the whole sub-family *Lycæninæ* without exception. In these larvæ the outline is always oval in shape and, when the insect is at rest in an unalarmed state, the greatest height is exactly midway between the two ends, the dorsal outline being a gentle curve, the ventrum being flat. It is necessary always to consider the shape in this state for nearly all these caterpillars can change their form more or less and an excessively stretched specimen, especially when feeding, does not present the same aspect as one that sits with its head drawn in and front segments bunched in a position of alarm; both, again differing from the appearance it has when at rest.

A.—Larva normal, longly oval in shape, the dorsal outline more or less gently convex, highest in the middle.

a. Larva when full-grown never over 15 mm. in length.

a[1]. Larva bordered round the margin with a dense fringe of long hairs. These always have also some long subdorsal hairs to each segment.

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a^2. Larva with whole surface covered with minute, simple, white tubercles each surmounted by a minute, white hair .. .. *Zizera otis.*

b^2. Larva with surface covering not so.

a^3. Larva with the long subdorsal hairs with thickened tops to them .. .. *Castalius ananda.*

b^3. Larva with the subdorsal hairs simple.

a^4. Larva covered with white or brown star-shaped tubercles .. .. .. „ *rosimon.*

b^4. Larva with no star-shaped tubercles or hairs.

a^5. Larva covered with appressed, pointed, white hairs .. .. .. „ *decidea.*

b^5. Larva covered with erect, pointed, white hairs .. .. „ *ethion.*

b^1. Larva bordered round margin with sparse fringe of long hairs.

a^2. Larva with distinct, long, subdorsal hairs only .. .. *Tarucus theophrastus.*

b^2. Larva with distinct sub-dorsal and spiracular, long hairs .. .. *Chilades trochilus.*

c^2. Larva with no long, distinct, subdorsal or spiracular hairs.

a^3. Larva with no star-shaped tubercles in the clothing.

a^4. Larva with the clothing consisting partly at least of appressed hairs or hairs with the tips bent back.

a^5. Larva clothed with dark, tubercular hairs and white hairs with recurved tips.. .. .. .. *Jamides celeno.*

b^5. Larva with the clothing consisting of shiny, colourless, appressed hairs .. .. *Lampides bœticus.*

b^4. Larva with neither appressed hairs nor hairs with recurved tips.

a^5. Larva clothed with minute spine-like hairs having little branchlets at their bases .. .. *Catachrysops strabo.*

b^5. Larva having no such hairs with branchlets at the bases.

a^6. Larva clothed with a dense covering of minute, erect, black, simple hairs with thickened bases. „ *pandava.*

b^6. Larva clothed with minute, erect, brown hairs from cylindrical, white tubercles .. .. .. *Zizera lysimon.*

c^6. Larva clothed with minute simple erect, black hairs which are chiefly confined to the prominent parts of each segment .. .. „ *gaika.*

b^3. Larva with star-shaped hairs or tubercles in the clothing.

a^4. Larva clothed with minute, 5-6-pointed, short-stemmed white stars—star-like, dilated hair-tops? .. .. *Catochrysops cnejus.*

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b^4. Larva with the star-shaped, minute bodies sessile.
a^5. Larva with clothing of minute, fine, conical, black hairs from black star-bases; some golden similar ones also. *Jamides bochus.*
b^5. Larva clothed with sessile, white stars bearing a brown bristle.
a^6. Larva having some broad, white, minute hairs in addition .. .. *Jamides elpis.*
b^6. Larva having some minute ring-spots besides, white, surrounded by a brown band .. .. .. *Zizera maha?*

c^1. Larva with a fringe of marginal hairs only round the front and anal segments.
a. Larva with a clothing of small, simple, bifurcated hairs obscured by the cottony covering of scale-insects .. .. .. *Spalgis epius.*
b. Larva with covering otherwise.
a. Larva with the clothing without star-shaped bodies.
a. Larva with sparse covering of minute, erect, thick-based hairs .. .. *Azanus ubaldus.*
b. Larva with covering of appressed hairs; not erect.
a. Larva with appressed, broad, translucent-white hairs .. .. .. *Azanus uranus.*
b. Larva with covering of appressed, light, thick-bases hairs .. .. *Lycaenesthes lycuenina.*
b. Larva with clothing of star-shaped minute tubercles each bearing a central minute hair.
a. Larva having the central hair erect, bristle-like it and the stars red; also simple, shiny, yellow-white stars .. *Nacaduba nora*, Feld. =*ardates*, Moore.
b. Larva having the central hair of stars bent back, parallel or nearly so to body-surface.
a. Larva with the central hair of star with a flat, disc-like, pear-shaped, white appendage from its tip and at right angles to it, parallel to body-surface .. .. .. *Nacaduba atrata.*
b. Larva with the central hair of star blunt, golden, bent back against body surface .. .. *Lycænopsis puspa.*

d^1. Larva with no marginal fringe longer than the rest of the clothing of body.
a. Larva with stars in the clothing.
a. Larva with the clothing of minute, white, star-shaped tubercles from the centre of each of which grows a small, colourless hair which is bent down; also conical tubercles with similar, erect hair.. .. .. *Nacaduba plumbeomicans.*

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b. Larva with the covering of minute, sessile, white and brown stars .. .. *Tarucus plinius.*

b. Larva with no stars in the clothing.

a. Larva with body covered with minute, annular, scale-like, white bodies—flattened tubercles? .. .. .. *Lycænesthes emolus.*

b. Larva having no annular bodies in the clothing.

a. Larva with a clothing of not very densely disposed, short, fine, light hairs .. .. *Talicada nyseus.*

b. Larva with covering of erect, brown short bristles .. .. *Neopithecops zalmora.*

b. Larva, when full grown, never under 18 mm.

a^1. Larva with a black, central, dorsal patch on segment 2.

a^2. Larva with the small, circular, white organ-mouths on segment 12 surrounded with a black border which is produced on the inside towards the dorsal line, the whole looking like a pair of spectacles. Colour light green, more or less immaculate .. *Arhopala canaraica.**

b^2. Larva with no spectacle-mark. Colour green with white, longitudinal bands .. *Thaduka multicaudata.*

b^1. Larva with no black mark on segment 2.

a^2. Larva with segment 2 concolourous with the rest of the body. Colour rose-pink or pinkish-green with few markings .. .. *Arhopala bazalus.**

b^2. Larva with segment 2 not so but with a broad, dorsal, red-brown band.

a^3. Larva green in colour with heavy red-brown marking .. .. „ *amantes.*

b^3. Larva green in colour with red-brown marking confined to a broad, dorsal, longitudinal band .. .. .. „ *centaurus.*

B.—Larva abnormal; that is, highest at segments 5, 6 or parallel-sided from segment 4 to segment 11; the dorsal outline often lowest at segments 10, 11.

a. Larva parallel-sided, the dorsal line straight.

a^1. Larva with permanent, prominent, short, tubular mouth to the organs on segment 12.

a^2. Larva with dorsum of segment 2 white. Colour of larva light green to light flesh-coloured with lateral brown markings .. *Aphnæus hyypargyrus.*

b^2. Larva with dorsum of segment 2 black-brown with indistinct, diagonal, white lines laterally .. .. „ *vulcanus.*

c^2. Larva with dorsum of segment 2 not distinctively coloured.

a^3. Larva with clothing of silvery-white, star-hairs. Colour smoky-brown with a short, white dorsolateral streak to each segment .. .. „ *concanus.*

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b^3. Larva with clothing of star-shaped hairs of the same colour as the ground they are on; the colour greenish, speckled thickly with brown .. .. .. *Aphnæus lohita.*

b^1. Larva without tubular mouths to organs of segment 12.

a^2. Larva with large, triangular, lateral tooth-expansions to anal segments.

a^3. Larva with spiracles black .. .. *Rapala lankana.*

b^3. Larva with spiracles white .. .. ,, *melampus.*

c^3. Larva with spiracles brown .. .. ,, *shistacea.*

d^3. Larva with spiracles bright yellow-brown .. .. ,, *orseis.*

b^2. Larva without these teeth to anal segments.

a^3. Larva with the margin of segment 2 indented so as to make 4 large marginal, triangular teeth .. .. *Zezius chrysomallus.*

b^3. Larva with segment 2 more or less normal, evenly rounded.

a^4. Larva with anal segment with two, widely-separated short tails or points at hinder margin .. .. .. *Chliaria othona.*

b^4. Larva with no such tail-points.

a. Larva clothed with minute, short, disc-topped hairs. Colour light-green, marked brown .. .. *Catapœcilma elegans.*

b. Larva clothed with simple hairs, colour pure dark green .. .. *Tajuria argentea.*

b. Larva not parallel-sided or always highest in segments 5 and 6.

a^1. Larva with long, permanent, tubular mouths to the organs on segment 12 .. .. .. *Curetis thetis, bulis.*

b^1. Larva with segment without such tubes.

a^2. Larva with segments 12-14 dorsally flat and together forming a dorsal, circular, flat area for cleaning out the galleries the larva lives in in fruits.

a^3. Larva without a saddle-patch of a different colour to rest, on segments 7, 8. Colour green .. .. *Deudorix epijarbas.*

b^3. Larva with segments 7, 8, coloured differently to rest.

a^4. Larva with saddle on segments 7, 8 whitish .. .. *Virachola isocrates.*

b^4. Larva with saddle on segments 7, 8 creamy white.

a^5. Larva with ventrum not orange .. ,, *perse.*

b^5. Larva with ventrum orange .. *Bindahara sugriva.*

b^2. Larva with anal segment normal.

a^3. Larva with the dorsum of the medial six segments produced into, each, a large triangular, fleshy tooth.. .. *Cheritra jaffra.*

b^3. Larva not so but with dorsal and marginal long, fleshy processes .. .. *Rathinda amor.*

c^3. Larva without such dorsal or marginal teeth or processes.

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a^4. Larva with surface naked except for a few smooth tubercles or marginal, soft hairs.

a^5. Larva with a few marginal hairs at both ends. Color bright greenish yellow with three electric-blue, broad, longitudinal bands. Outline that of a shoesole .. .. .. *Amblypodia anita.*

b^5. Larva with a few marginal hairs and sparse tubercles all over the surface. Colour light and dark greens .. .. *Zinaspa todara.*

c^5. Larva with no marginal hairs.

a^6. Larva with surface dull, plain green .. .. *Tajuria jehana.*

b^6. Larva with surface shiny, covered with minute, smooth tubercles.

a^7. Larva without a distinct waist in segments 9, 10 .. .. *Loxura atymnus*

b^7. Larva with a distinct waist at segments 9, 10.

a^8. Larva covered with yellow tubercles. Colour chocolate. *Tajuria indra.*

b^8. Larva covered with white tubercles. Colour green, red, yellow and brown arranged as the pattern in *Tajuria cippus*.. .. .. .. *Camena cleobis.*

c^8. Larva completely naked, without tubercles .. .. *Tajuria cippus.*

b^4. Larva clothed with a dense covering of tubercles and hairs; no marginal hairs.

a^5. Larva with clothing of minute, erect, sharp hairs on a short, cup-shaped base with indented margin. Colour velvet pinkish .. .. *Pratapa deva.*

b^5. Larva with clothing of flat-topped, circular, yellow, minute tubercles interspersed with minute, spine-like, red tubercles. Colour velvet pinkish, a darker dorsal line; when about to pupate develops a dark-green saddle at waist. Two small tail-points .. .. *Ops melastigma**

c^5. Larva clothed with minute, curved, thick-topped hairs with a longer, subdorsal hair on segments 5 to 9 and a similar, curved one at each lateral angle of the dorsal depression of segment 2. Colour that of *Zinaspa* which it closely resembles. *Surendra quercetorum.*

The clothing of all these larvæ requires a fairly powerful lens as it is, in most case, composed of very minute bodies. The star-shaped tubercles and hair-tops especially are difficult to see, the thick bases to the hairs and so

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on, also. It will be seen that the key is not very satisfactory as regards the grouping into genera; so that it is probable that it is thoroughly artificial though something might be got out of repeated efforts at classification of the kind. One of the objections to any such co-ordination of facts at the present time is the fragmentary knowledge available as there are hundreds and hundreds of species of this family the larvæ of which are quite unknown. However, as said before, the key has to be taken for what it is worth and may be useful later on as a sort of basis to work upon when there is more material forthcoming.

The species with an asterisk placed against them are such as have not been included in the key to the imagines or perfect insects. These were originally left out because it was thought that they were confined as to locality to the Kanara District of the Bombay Presidency, their occurrence not having been noticed elsewhere. Some few *Satyrinæ*, *Nymphalinæ* and *Papilioninæ* have been omitted also for the same reason in former parts of these papers. All these will be brought out as an appendix at the end of the *Hesperiidæ*, the last group to be dealt with. It would have been simpler to have included them all at the beginning but that cannot now be helped.

Genus—NEOPITHECOPS.

This genus extends from India and Ceylon to Burma, the Andaman Islands and the Malay Peninsula. There is only one species known from India, Ceylon and Burma: the one described here. It has wet-and-dry season broods.

127. Neopithecops zalmora.—*Wet-season brood.*—Male and female. *Upperside*: dark purplish brown; in the female slightly paler on the disc of the fore wing. In most specimens, but not in all, the male also has the disc of the fore wing similarly paler. *Underside*: white. Fore wing: apex dusky brown, apices of veins 10, 11, 12 with a minute, black dot; no discal markings, but the discocellulars picked out with a short, very slender, obscure, brown line; a postdiscal, irregular transverse series of slender, brown lunules, followed by a transverse, very slender, sinuous, brown line, the white ground-colour in the interspaces beyond centred by a subterminal series of transverse, black spots. Hind wing: discocellulars with a short, brown line similar to that on the fore wing, followed by a subdorsal, round, black spot and a subcostal, much larger, similar spot; between these two spots is a curved, very irregular line of detached, pale ashy-brown lunules; the subterminal markings very similar to those on the fore wing. Cilia of fore wing dusky brown, of hind wing, white. Antennæ, head, thorax and abdomen dark brown; antennæ, on the inner side, speckled with white; beneath: the palpi, thorax and abdomen white.

Dry-season brood.—Male and female. Differs from specimen of the wet-season brood as follows:—*Upperside*: ground-colour not so dark generally. Fore wing: a large oval, snow-white spot placed obliquely on the disc. Hind wing: apex and disc irregularly white; on the posterior half the ground-colour a shade darker than on the anterior half. *Underside*: ground-colour and markings similar to those of specimens of the wet-season brood, but the markings very much paler and fainter; in specimens taken in the middle of the dry season in exceptionally dry localities these markings are altogether absent. Antennæ, head, thorax and abdomen on the upperside paler than in the wet-season brood. Expanse: male and female, 16-28mm.

Egg.—Shaped like a section of a cylinder; that is, turban-shaped. Surface polished but somewhat obscured by an irregular net-work of fine

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ridges forming irregular shallow cells with flat bottoms; at each intersection of the lines is a little knob which is blunt and has the appearance of a little star with the ridges radiating from it; the cells are very small on top where there are no knobs. Colour: light green, the raised lines and knobs pure white. B. 8mm.

Lava.—Is of normal shape—onisciform, broadest about the middle. The head is hidden under the second segment and is shining, translucent, dirty whitish in colour with a brown suffusion about the jaws and eyes; it is round in shape. Segment 2 is rounded along the front margin, inclined to be hexagonal in shape taken as a whole, the extreme front being more or less straight; in the middle of dorsum is a more or less triangular depression, the apex pointing forward, with a black dot at each basal angle. The mouth-shaped gland on segment 11 often has a little feathered hair at each end. The little organ openings of segment 12 are circular, emitting now and then, at the will of the larva, little white cylinders which are again withdrawn. Anal end of body rather square at the extremity, the surface pitted just inside the margin. Surface of body showing the segments, as a rule, well marked, a slight, circular depression in the dorsal line on segments 3, 4; all the segments 5-10 have a slightly depressed, central, transverse line over dorsum; the whole larva is clothed with erect, short, brown, stiff hairs. Spiracles flush, nearly circular, dark brown, surrounded by a double, thin, black line. Colour of body is dark grass-green without any markings. L: 10mm; B: 4mm.

Pupa.—Of normal shape. The head is bent under, the front margin of segment 2 being the front of pupa. Segment 2 is rounded along front margin, minutely indented in dorsal line of that margin; sloping gently upwards to thorax; thorax is humped, slightly laterally compressed, about the same breadth as segment 2; abdomen is rather stout, a bit broader than thorax at segment 7/8 as also a little higher; the last three segments narrow and perpendicular to longitudinal axis of pupa. Surface covered with short, erect, stiff brown hairs, each from a minute tubercle: these bristles not too short, quite perceptible. Spiracles of segment 2 indicated by raised, white, narrow lines; the rest flush, nearly circular; light in colour, of ordinary size. Colour green, speckled with dark brown; shoulders black-tipped; a row of lateral, black spots on abdomen. L: 8·5mm; B: 4·5mm; H: 3·5mm.

Habits.—The eggs are laid on the stalks of young shoots or amongst the flowers in an axil. They are laid single, the butterfly walking slowly about to choose a place for each one. The larva, when it first emerges and when on a flower, bores into a bud to get at the soft, young parts; when on a tender leaf—the egg is never laid on an old one—it eats the outside layers of the undersurface. Later on, when bigger, it eats in the ordinary way from the edge. It is very sluggish and falls to the ground when disturbed, curling up its body in a circle. It is attended intermittently by ants of different kinds of small dimensions. Pupation takes place on a leaf, in a crevice, nearly anywhere and the chrysalis is attached tightly by the tail and a body-band. The growth of the larva is moderately quick and the pupal stage of normal duration—about 10 days.

The perfect insect, the butterfly, is found nearly everywhere the food-plant exists: *Glycosmis pentaphylla*, a rutaceous species common

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in the evergreen jungles of the Western Ghats. The shrub is an evergreen with dark green, leathery, 1 to 5-fingered leaves with long stalks, the young shoots grey-mealy when very tender as a rule, the flowers in little compact clusters mostly at the end of the branches in the axils of leaves, small, whitish, the petals soon falling. The butterfly is a week flier, keeps generally quite close to the ground in the jungle; but is conspicuous because of the glancing of the white underside in the shade. It rests on the upperside of a leaf and occasionally comes to damp places on the ground. It is very like *Magisba malaya* in look and habits. It has been seen in Bombay itself, Poona, Thana. The distribution is India to Burma, Tenasserim, Andamans, extending to the Malay Peninsula. It is very common in Kanara.

Genus—Spalgis.

The genus is, according to Colonel Bingham, confined to the Indo-Malayan Region. Its chief character consists in the fact that the larvæ are carnivorous or rather, insectivorous which is quite an exceptional thing in butterflies. There is only one species.

128. Spaigis epius.—Male. *Upperside*: dull brown, slightly darker towards the apex of the fore wing; also a more or less quadrate, whitish spot beyond the apex of the cell on the same wing; in some specimens this spot is slightly diffuse. *Underside:* pale, silky brownish-white; fore and hind wings crossed by numerous, very slender, short, sinous, transverse, dark-brown strigæ which are outwardly slenderly edged with brownish white of a shade paler than that of the ground-colour; both wings with an ante-ciliary dark brown line with, on the inner side, a similar edging. Fore wing, in addition, with an oval, white spot beyond the cell. Cilia of both fore and hind wings of the same shade as the brown colour of the wings. Antennæ, head, thorax and abdomen pale brown; club of antennæ ocharceous at apex; beneath: the palpi and thorax brownish-greyish, abdomen pale brown. Female. *Upperside*: slightly paler brown. Fore wing: the cell and apex darker; a white spot similar to that in the male, but larger, beyond the apex of the cell; in most specimens extended diffusely outwards and downwards. Hind wing: similar to that of the male. *Underside*: precisely as in the male. Antennæ, head, thorax and abdomen paler than in the male. Expanse: male and female, 22-28mm.

Larva.—The shape is onisciform: a long, compressed oval; the ventrum is flat, the dorsal longitudinal outline a depressed, even, convex curve. The head is small, round, with a longish neck when protruded; generally hidden under segment 2; segment 2 short, deeply indented in dorsal line on the front margin, this indentation accentuated by a subdorsal tuft of porrect hairs on either side; segment 3 suddenly rather higher than segment 2; segments 3-11 all similar to each other; segments 12-14 together about equal to one of these; the anal segment having its dorsal surface in a plane nearly perpendicular to longitudinal larval axis; none of the segments very distinct. Spiracles small and round, at the lower extremity of a deeply impressed line down the centre of each segment 4-11 parallel to segment-margins but not reaching dorsal region nor the subspiracular region; these spiracles difficult to distinguish. Surface of body obscured dorsally by white powder and fluff of the insects (plant-lice), the larva feeds upon so that it is impossible to see any detail of the structure unless this is at first

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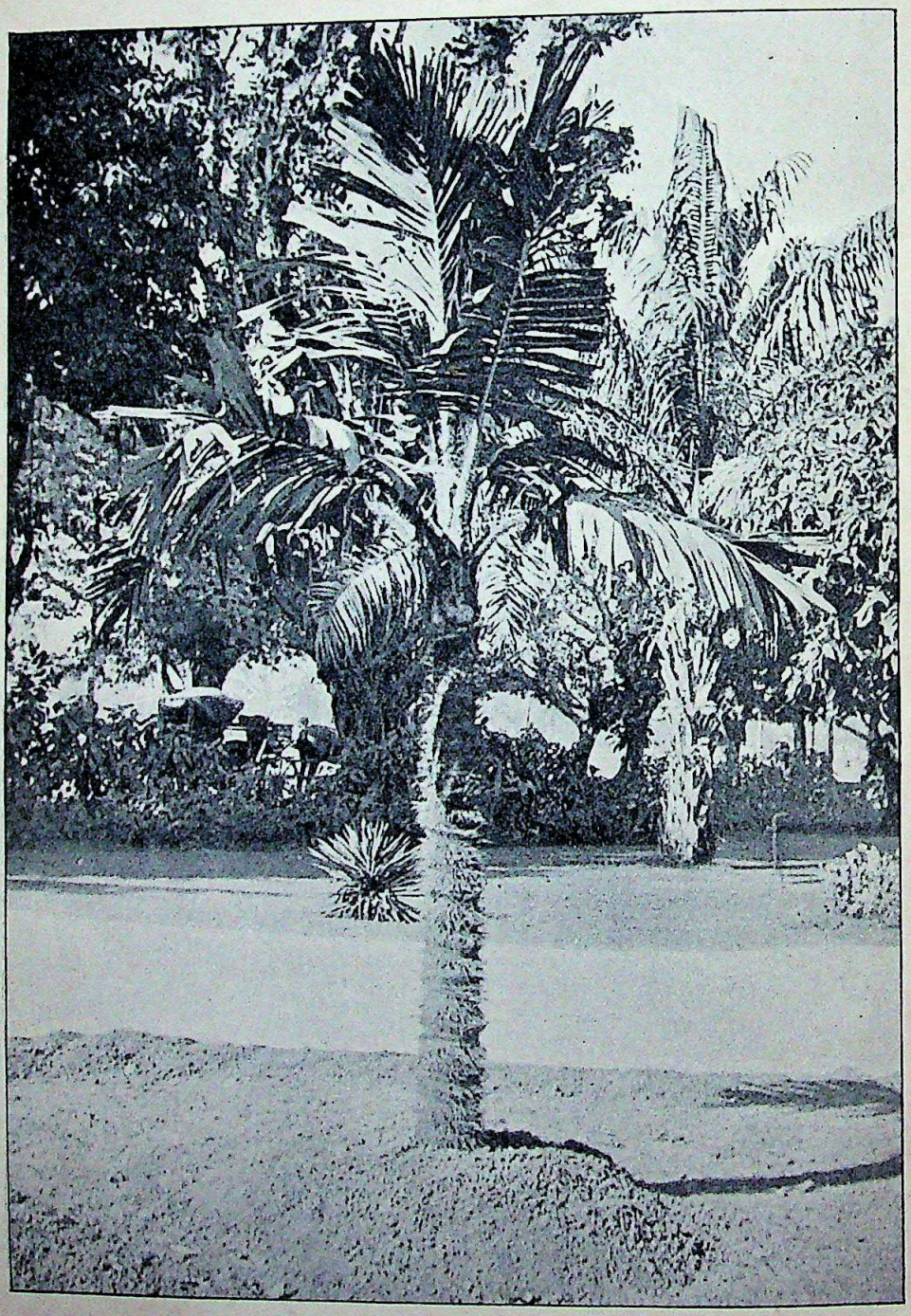

Martinezia Lindeniana, H. Wendl.

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as the calyx; petals oblong-lanceolate, acute, coriaceous, the inner side longitudinally striate. Stamens 6, included; filaments very short, filiform, white; anthers linear, erect, subsagittate at the base; pistillode minute. Female flowers: calyx triphyllous, membranous; sepals broadly-ovate, scarcely 1 line long; with spine; rhachis unarmed; branches many, 3-6 inches long, corolla twice as long, coriaceous; petals ovate, acute, concave; staminodes forming a membranous, 6-dentate urceolus. Ovary ovate, glabrous, trilocular, 2 loculi being abortive. No style; stigmas 3, pyramidal-acute, erect. Drupe globose, size of a cherry, albumen solid, equable, cartilaginous.

HABITAT.—Brazil, Peru, Bolivia.

ILLUSTRATION.—Plate XC shows the most characteristic parts of Martinezia caryotæfolia: the stem thickly covered with slender spines, and a leaf resembling very much that of the Indian Caryotas. It was just this resemblance which has given this palm its specific name "*caryotæfolia.*" The photograph was taken by the Rev. M. Maier.

MARTINEZIA LINDENIANA, H. Wendl. in Linnæa, XXVIII (1856), 349.

VERNACULAR NAME—In New Granada: Alvarico.

DESCRIPTION.—Stem densely covered with spines. Leaves aggregate —pinnatisect; petiole with black spines; rhachis covered with a yellow-brown tomentum, densely intermixed with short black spines; leaflets—$\frac{5}{6}$—$1\frac{1}{6}$ foot long, foliaceous, præmorse at the apex, middle nerve bearing 1 or 2 long spines towards the base on the underside, and some on the upper surface towards the apex.

Spadix elongate, simply branched, branches very long, the bases of the lower ones bearing no flowers for a short distance; peduncle with long spines; peduncle, rhachis and branches covered with brown tomentum and small stiff spines.

Fruit a drupe, rose-coloured.

HABITAT.—New Granada.

This palm was discovered by Linden in December 1855 who found it growing in the forests near Florida, New Granada.

ILLUSTRATION.—The palm figured on Plate XCI was growing in the garden of the Cama Hospital, Bombay. On the stem only a spiral groove is left free from spines, indicating the place where the leaves were attached.

BACTRIS, JACQ., Stirp. Amer., t. 256.

(From "baktron," a cane; the young stem being used for walking sticks).

Kunth Enum. Pl. III, 261.—Karst. Linn. 28, 397, 405.—Mart. Hist. Palm. II., 92, t. 60, 70, 72, 73, 74; III., 279, 321.—

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Wallace Palm. Amaz. 76, t. 28-35, 45.—Griseb. Fl. Brit. W. Ind. 519.—Oerst. Palm. Centro-Americ. 1858, 40, t. 8, 9.—Trail in Trim. Journ. Bot. 1876, 354; 1877, 1, 40, 75, 132, t. 184.—B. Rodr. Enum. Palm. 26.—Drude Fl. Brasil. III, II. 316.

Usually low palms, often cæspitose, but sometimes reaching as much as 70 feet; stem very thin, or thicker and cane-like, always spinous. Leaves often scattered, but chiefly approximate above, pinnatisect, rarely bifid-entire; segments usually linear, acuminate; spadix according to the thickness of the stem delicate or stout, simply branched or simple, axillary, sessile or peduncled; spathes 2, upper one spinous or bristly-hairy. Flowers monœcious, small, green, rosa or dark-yellow, in glomerules of 3 and of 2 males in the upper part. Male flowers: calyx tripartite or trifid, sepals acute; corolla tripetalous, petals acute; stamens 6, 9 or 12, rising from a fleshy disc; filaments subulate; anthers linear, erect. Female flowers globose or cylindric; calyx urceolate or ring-shaped; corolla urceolate or cylindric, staminodes forming a membranous ring. Ovary ovate or prismatic-trigonous, unilocular by the abortion of 2 loculi; stigmas 3, sessile, pyramidal. Drupe ovate or globose, 1-seeded; putamen roundish or elongate, with 3 pores, the one above the embryo differently located than the two others which are closed.

Species about 90.—53 species in Brazil, Peru, Bolivia and Guyana; the rest in the Antilles and Central America.

CULTIVATION IN EUROPE.—Very ornamental, slender growing stove palms. Some of the species are of easy culture in a compost of loam, peat, leaf mould, and sand, in equal parts; but most of them are very difficult to treat. Propagation may be effected by seeds or by suckers, which are very freely produced.

BACTRIS MAJOR, Jacq. Stirp. Amer. 280, t. 171, f. 2; Mart. Palmet. Orbignian 62.—Drude. Fl. Bras. III, I, 358, t. LXXIV, f II.—B. *Achætorhachis*. Mart. Palm. Orbign. 61; Trail in Journ. Bot. (1877), 49.—*Augustinea major* Karst. in Linnæa (1856), 395.—*Pyrenoglyphis major* Karst. Fl. Columb. spec. sel. II, 141, t. CLXXIV.

VERNACULAR NAME.—In Brazil: Coco de vinagre (ex Drude).

DESCRIPTION.—Stem 1-1$\frac{3}{5}$ inch in diameter, cæspitose, usually 15 feet high, rarely 20 or more, armed near the rings with black retro-curved spines about 2 inches long. Leaves 6-7 forming a terminal crown, 5-7 feet long, equally pinnatisect; sheath short, rhachis slender, elongate, both covered with whitish or fuscous tomentum and armed with spines which are 1$\frac{3}{5}$-2$\frac{2}{5}$ inches long, black, stout, terete-subulate; petiole much shorter than the rhachis; segments 25-35 on each side, one-nerved (the apical ones sometimes many nerved), narrowly linear-lanceolate, long acuminate, $\frac{2}{3}$—1 foot long and $\frac{2}{5}$-$\frac{7}{12}$ inch broad, glabrous on both sides, armed along the margins with black bristles, the apex more densely setose.

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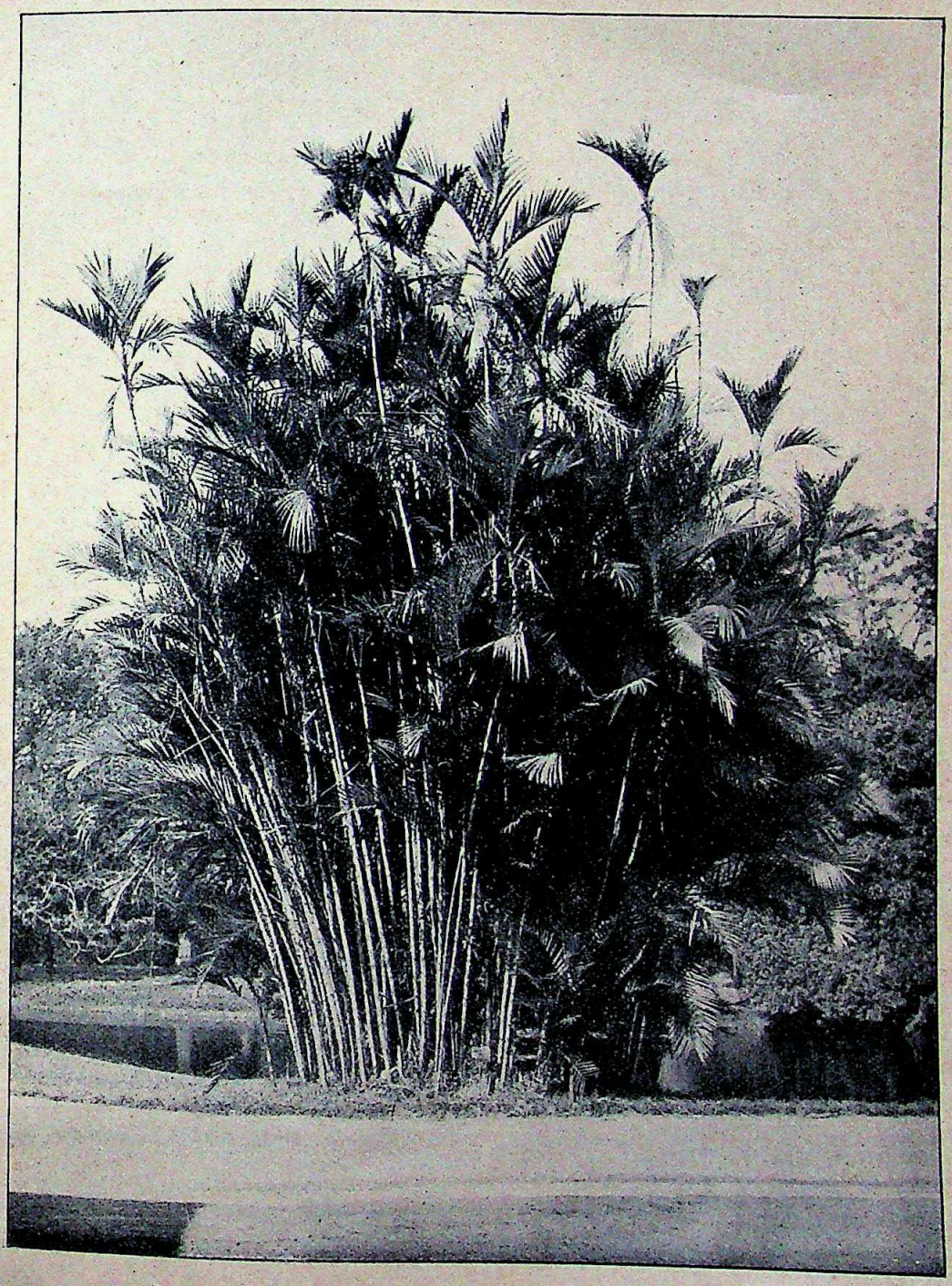

Bactris major, Jacq., growing in the BOTANIC GARDENS OF SIBPUR.

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Spadix $\frac{2}{3}$—1 foot long, patent between the leaves; spathe densely covered with long, black, thin, retro-curved spines; peduncle about $\frac{1}{3}$ foot long, as long as the branches; rhachis very short, $\frac{2}{5}$-$\frac{4}{5}$ inch; branches rigid, few (5-8), $\frac{1}{3}$ ft. long and longer, densely floriferous from base to apex. Male flowers: $\frac{7}{25}$ inch long; calyx trifid; corolla trifid almost half-way down; anthers long; filaments short; pistillode 0. Female flowers slightly smaller than the male ones, ovoid; calyx urceolate including the urceolate corolla. Drupe ovoid, bluish-black, about $1\frac{3}{5}$ inch long and $1\frac{1}{5}$ inch in diameter; exocarp thinly scabrous; putamen much thickened, obliquely ellipsoidal, $1\frac{1}{5}$ inch long and $\frac{4}{5}$ inch broad; albumen fleshy, excavated.

HABITAT.—New Granada, Guiana, Brazil.

ILLUSTRATION.—The beautiful tuft of *Bactris major*, figured on Pl. XCII, grows in the Botanic Gardens of Sibpur. We have to thank Major Gage for kindly supplying the photograph.

V.—*PHYTELEPHANTINÆ* (Palmæ anomalæ.)

Numerous complete or incomplete spathes. Male and female branches (or spadices) separate. Perianth of one of the sexes absent or rudimentary. Fruits forming a syncarpium, 1-multilocular.—Leaves regularly pinnate; leaflets reduplicate.

Phytele-phas, R. & P., Nipa, Thumb.

PHYTELEPHAS, R & P.

(From the Greek "phyton," plant, and "elephas," elephant, ivory.)

Willd. Sp. Pl. IV. 1158.—Gaudich. Voy. Bon. t. 14-16, 29, 30. —Karst. Lin. 28, 275.—Mart. Hist. Nat. Palm. III. 306.—Kunth Enum. Pl. III. 109.—Spruce Journ. Lin. Soc. IV. 186.—Benth. & Hook. Gen. Pl. III. II, 921, 79.

Stemless or low-stemmed palms, up to 20 feet high. Crown very dense. Leaves 12-20, pinnate, 15-20 feet long; leaflets 150—160, alternate at the base, opposite towards the upper end. Spadices growing from between the leaves, diœcious. Male spadix simple, long; spathes 2-4, almost complete. Male flowers with an irregularly cup-shaped, denate perigone or with crossed leaflets. Stamens ∞ (30 and twice or thrice as many); filaments filamentous; anthers linear, attached close to the base; pollen finely spinous. Female spadix simple; spathes comparatively longer. Female flowers in a dense bundle which is covered by many spirally arranged bracts; immediately surrounded by 2 rows of irregular, long-acuminate leaves, the outer shorter row mostly of 3, the inner much longer one of 5-10 leaves; staminodes many, with barren anthers. Ovary globose, with mostly 5 (4-9) loculi; style long-columnar; stigmas as many as there are loculi, long-filamentous; ovule 1 in each loculus;

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placenta axile. Fruiting spadix consisting of an aggregate of about 6 or more compressed and united berry-like fruits (syncarpium); each fruit commonly with 4-6 seeds in as many loculi, pericarp with hard-woody protruberances. Albumen uniform, very hard, slightly excavated.

Species at least 3, probably more.—Tropical America, between 9° N. L. and 8° S. L., 70—79° W. Long.

PHYTELEPHAS MACROCARPA, R. &. P., Syst. Veg. Fl. Peruv. et Chil. 301; Humb. Kth. Nov. Gen. I, 83; Kth. Enum. III, 109; Mart. Hist. Nat. Palm. III, 306; Hook. Journ. of Bot. and Kew Misc. I. 204; Seem. Bot. Herald, 208, t. 45, 46, 47, ejusdem Bonpl. III. 270, t. 182; Bot. Mag. 4913, 4914—*Elephantusia macrocarpa*, Willd. Spec. IV., 1156.

Names of the Tree.

English: Large-fruited Ivory Plant, Ivory Palm, Ivory nut Palm, Vegetable ivory Plant, negro's head Palm.
German: Elfenbeinpalme. Taguabaum.
Dutch: Ivoornoot, ivoorpalm.
Spanish: Palma de marfil.
Indians of the Magdalena: Tagua.
Indians of the coast of Darien: Anta.
Peru: Pullipunta, Homero.

Names of the Fruit.

English: Negro's head.
German: Negerkopf.

Names of the Kernels.

English: Ivory nuts, palm ivory, vegetable ivory.
French: Ivoire végétal, noix de corozo.
German: Corozanuss, Corusconuss, Elfenbeinnuss, Steinnuss, Taguanuss, vegetabilisches Elfenbein.
Dutch: Ivornooten, palmivoor, plantenivoor.

Description.—Stem always pulled down, partly by its own weight, partly by its ærial roots, thus forming a creeping caudex, frequently 20 feet long, but seldom higher than 6 feet. Leaves 12-20 in number, 18-20 feet long, segments towards the base of the leaf alternate, towards the apex opposite, 3 feet long, 2 inches broad, about 160 in number. Seem to be diœcious, the males being more robust, more erect and higher, than the females. The inflorescence of both emits a most penetrating almond-like smell. Male spadix simple, fleshy, cylindrical, which has 3-4 spathes, the flowers of which are densely crowded together and sessile. Each flower furnished with a small bract. Sepals 3. Stamens numerous; filaments filiform; anthers

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MALE IVORY-NUT PALM (*Phytelephas macrocarpa*, R. & P.).

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linear, erect, affixed nearly at the base, bilocular; connective mucronulate, pollen elliptical, furrowed lengthways. Female spadix simple, bearing on the average from 6-7 flowers, forming a dense cluster, surrounded by bracts, placed in a spiral direction, the uppermost five of which, being often much longer than the style, but generally shorter and pure white, have the appearance of petals; staminodes numerous, free, inserted in the torus between the petaloid bracts and the ovary. Ovary 6-9 celled, each cell with a solitary, sessile, erect ovule, attached to an axile placenta; style elongated, splitting into 6-9 branches, stigmatose on the edges. Fruit a collection of from 6-7 drupes, which is as large as a man's head, and stands at first erect, but when approaching maturity, it hangs down. A plant bears at one time from 6-7 of these heads, each weighing when ripe, about 25 pounds. Drupe covered with hard woody protruberances, contains from 6-9 seeds, but generally seven; testa thick, bony; embryo peripherical and placed near the hilum.

HABITAT.—The ivory plant is confined to the continent of South America, between 9° N. L. and 8° S. L. and 70°-79° W. Long. It inhabits damp localities, such as confined valleys, and banks of rivers. It is found not only on the lower coast region, as in Darien, but also at an elevation of more than 3,000 feet above the sea, as in Ocaña. It is generally found in separate groves, seldom intermixed with other trees or shrubs.

USES.—The albumen of the fruit is almost chemically pure cellulose, the so-called vegetable ivory. In the beginning it is milky and serves as food on account of its flavour, but finally it becomes white and resembles so exactly the ivory obtained from elephants, as to be frequently passed off for such, and even employed by mechanics in place of that article. It has not yet been accurately ascertained when the vegetable ivory first came to be imported into Europe for commercial purposes; but there is reason to believe that it was shortly after the Spanish Colonies obtained their independence (about 1826). At the present day the ivory is largely exported into North America, England, Germany, etc. The Indians cover their cottages with the leaves of this tree; but this is only done when those of other palms are not procurable, as the latter last much longer than the former.

Morren has given a more detailed description of the nut in Vol. I of "Dondonæa, ou Recueil d'Observations de Botanique, p. 74," from which we give the following extract as translated by W. J. Hooker*:—

"The external covering of the ivory-nut (seed) is so hard as to be almost stony, yellowish-grey, smooth, and destitute of gloss;

* W. J. H. Some account of the Ivory Palm; in Kew Journal of Bot. I, (1849), 209-211.

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it is attached to a second coating, which is brown, porous, and dull, and is incorporated with it. Beneath a hollow, which separates these two integuments, is a third, brown, veined, warted and glossy covering, traversed by numerous fibres, under which lies the albumen, which forms the vegetable ivory. The vegetable ivory is of the purest white, and free from veins, dots, or vessels of any kind, presenting a perfect uniformity of texture, surpassing the finest animal ivory; and its substance is everywhere so hard, that the slightest streaks from the turning-lathe are observable, and cannot be erased till it is newly fashioned.

"When the article is carved, the vegetable ivory may be known by its brightness, and by its fatty appearance, whereon the well-skilled may discern the minute lines which are the beds of cells. Its structure would almost seem to show more analogy with bone than with ivory, but a microscopic investigation quickly proves that vegetable ivory possesses an entirely different structure.

"This structure is among the most curious in the Vegetable Kingdom.

"The external covering of the albumen is composed, as we proceed from the outside to the inside, of—

'I. A layer of ovoid cellules, with brown thick parietes, the elongated centre of each cellule is filled with a darker substance.

'II. A second layer of ovoid cells, placed perpendicularly on the first, but with the innermost elongated, and approximating towards the structure of the next layer.

'III. A third layer of cells, still more elongated and fusiform, their parietes are thick and brown.

'IV. A fourth layer of smaller and prismatic cells, placed perpendicularly and regularly over the preceding layer: they rest in their turn upon the last, which is

'V. A final layer of very dark and irregular cells, externally coated, on the side towards the albumen, with a brown colouring matter, which imparts its hue to the surface of the albumen, or vegetable ivory.'

"All the above-described organization belongs only to the integumentary system.

"The albumen, or vegetable ivory itself, is composed of concentric layers, of which only the most external differ from the most internal. When the albumen is hard, as was that which I examined, it presents a white substance, transparent in water, and which appears continuous, and not to be distinguished into various degrees of growth. It is perforated with an infinity of holes, the sections of so many cavities; the latter are irregularly rounded and also prolonged into arms or tubes, which give a starry appearance to the cavities, many of them being 5, 6, 7, 8 and 10-rayed.

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FEMALE IVORY-NUT PALM (*Phytelephas macrocarpa*, R. & P.).

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Here and there may be seen a little spheroidal cavity; finally the tubes appear to be each tipped with a small swollen head.

"Throughout the albumen the above-described structure is more or less regular, offering a beautiful study to the Vegetable-anatomist.

"Generally speaking, the starry cavities are arranged in a quinceux, so that the interval between two of them corresponds to a third. A little attention also enables the observer to see that those rays, which are terminated by a little head, answer always to one another. The space between these heads is largest in dry a slice and least in a moist one. The central cavity is sometimes empty, and sometimes filled with a substance composed of very minute globules, reaching occasionally to the very tips of the rays.

"It is evident that these starry cavities represent so many hollows of cells, which still preserve their radii of communication, though the primitive parietes are obliterated; and in some instances, the cavities only remain in the form of ovoidal cells, which still can be restored to their original configuration by immersing the portion of albumen in Canada balsam. I have dried a carefully cut slice of the ivory and then subjected it to the influence of Canada balsam, which rendered it so perfectly diaphanous as to be scarcely discernible by the naked eye from the balsam. This process has the effect of restoring the cells to their normal structure; they become 6-rayed, the tubes correspond exactly with each other and every one is tipped with a swollen head, and more or less filled with the globular substance of which I have spoken. Thus we see revealed the whole organization of vegetable ivory, which is merely a prismenchyme with thickened cells, in which the rays of communication are preserved. The closest scrutiny has not enabled me to detect in the thick portion of the cells the smallest trace of those layers of growth which have been detected by M. Valentin, especially in the *Hoya carnosa* and *Oreodoxa regia*, etc.

"This substance, which appears continuous, is very analogous to that which MM. Schleiden and Theodore Vogel, in their researches into the nature of the albumen, have found in the albumen of *Phœnix dactylifera*; only that in the latter, there is no starry disposition of the tubes, and the hollows of the cells are elongated into two, or, at most, into three radii of communication." (Morren).

Cultivation in Europe.—This palm thrives in a compost of two parts rich loam, one of peat, and one of river sand. Perfect drainage and a liberal supply of water are essential.

Illustration.—The two photographs reproduced on Plates XCIII and XCIV were taken by Mr. Macmillan in the Botanic Gardens of Peradeniya, Ceylon.

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NIPA, Wurmb. ex Bl. Rumph II. 72; III, t. 164, 165.

(Nipa is the vernacular name of the palm in the Philippines.)

Lam. Illustr. t. 897.—Labill. Mem. V. t. 21, 22.—Kunth Enum. Pl. III. 110, 589.—Mart. Hist. Nat. Palm. III. 305, t. 108.—Miq. Fl. Ind. Bat. III. 150.—Blanco Fl. Filip. 662.—Griff. Ic. Pl. Asiat. 244—247.—Benth.—& Hook. Gen. Pl. III. II. 920, 78.—Vidal Fl. Forest. Philip. t.

A prostrate æstuarial gregarious palm; rootstock stout, branched, covered with the sheaths of old leaves, leafing and flowering at the ends of the branches. Leaves pinnatisect; leaflets linear-lanceolate, sides reduplicate in vernation. Spadix short, terminal, erect in flower, fruiting drooping. Flowers monoecious, male in catkin-like lateral branches of the spadix, female crowded in a terminal head, perianth glumaceous. Male flowers minute, surrounded with setaceous bracteoles; sepals linear with broad truncate inflexed tips, imbricate; petals smaller; stamens 3; filaments connate in a very short column; anthers elongate, basifixed; pistillode 0. Female flowers much longer than the male, sepals 6, rudimentary, displaced, staminodes 0; carpels 3, connate, tips free with an oblique stigmaticline; ovules 3, erect. Fruit large, globose, hsyncarp of many obovoid, hexagonal, 1-celled, 1-seeded carpels, wit pyramidal tips and infra-apical stigmas; pericarp fleshy and fibrous; endocarp spongy and flowery; seed erect, grooved on one side; testa coriaceous, viscid within, adherent to the endocarp; hilum broad; endosperm horny equable, hollow; embryo basilar, obconie. Species one.

This genus and Phytelephas are widely different from the other palms, exhibiting affinities to *Pandanceæ* (Screw-pines) and *Cyclanthaceæ*. "It is therefore a plant of the greatest interest to the botanist, and also, it may be added, to the geologist, as has been justly remarked by Bowerbank, Lyell, and J. D. Hooker, arising from the fact that nuts of a similar plant abound in the tertiary formations at the mouth of the Thames, where they once floated about in as great a profusion as those of *Nipa fruticans* do at the present day in the rivers of the Indian Ocean, until they became buried in the silt and mud which now formes the island of Sheppey." (Seeman).

NIPA FRUTICANS, Wurmb. in Verh. Bat. Genootsch. I. 349 (1779); Mart. Hist. Nat. Palm. III. 305, t. 208; Lam. Illustr. t. 897; Kunth. Enum. III. 110, 589; Miq. Fl. Ind. Bat. III. 150; Griff. Notul. III. 168; Ic. Pl. Asiat. 244; Roxb. Fl. Ind. III. 650; Thw. Enum. 327; Kurz. For. Fl. II. 541; Hooker Fl. Brit. Ind., VI, 424; Trimen Flora Ceyl. IV. 325—*Nipa litoralis*, Blanco Fl. de Filipinas 662—*Cocos nypa*, Lour. Fl. Cochinch, 694 (ed. Willd.)

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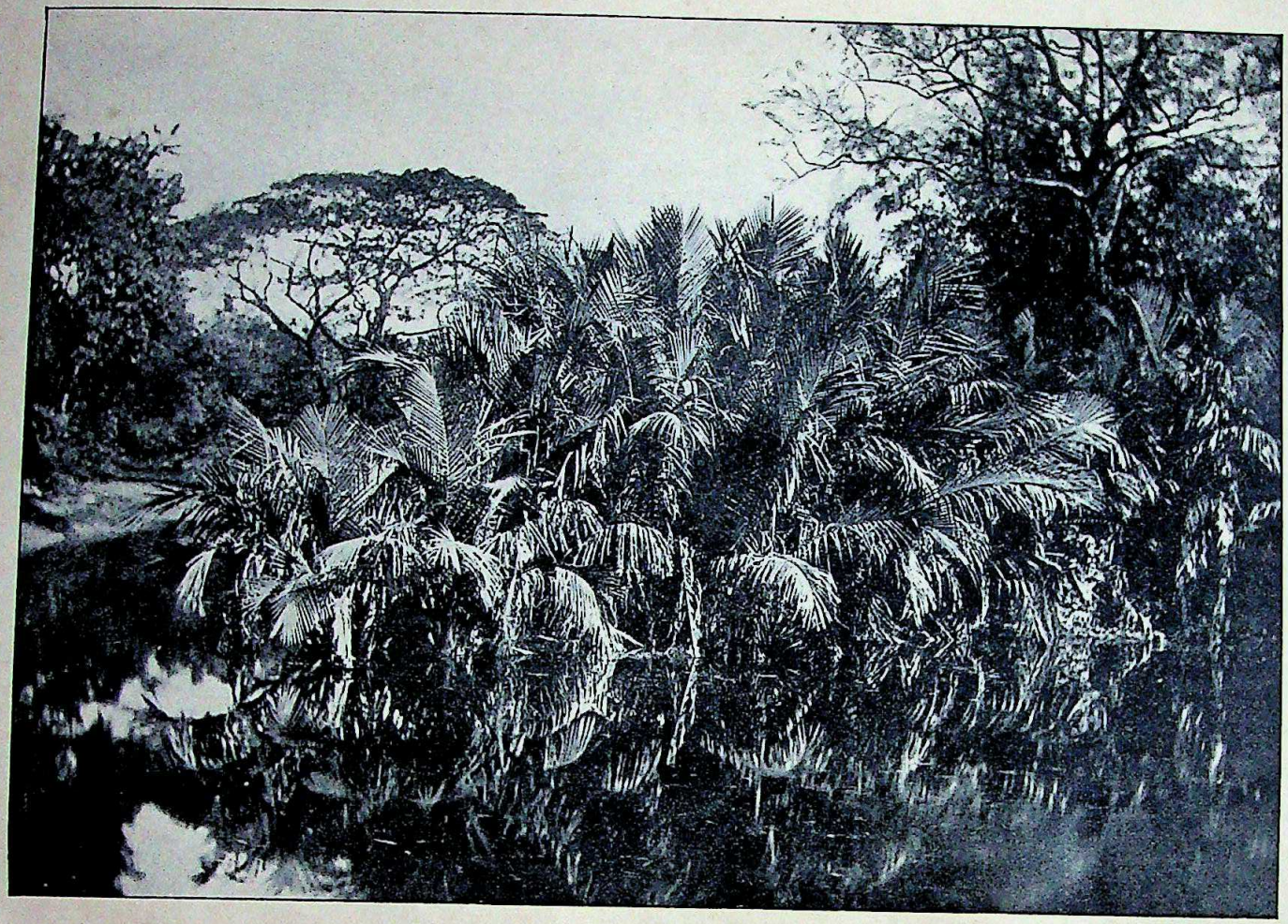

WATER COCONUT PALM (*Nipa fruticans*, Wurm.).

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removed; surface covered with erect, not very short, finally bifurcated hairs; each segment also with a subspiracular tuft of similar erect, longer, yellow hairs; segment 3 has these hairs along front margin; segments 2 and 14 have longer hairs round front and hinder margins respectively. Colour of larva green-rose, ventrally green; true legs very small. L: 11mm B: 4·5mm.

Pupa.—The shape and mode of attachment are those of *Tajuria cippus*. Head small, hidden under a somewhat large segment 2 which has its front and hinder margins quite flush with the pupal surface; front of head is in a plane perpendicular to longitudinal axis of pupa as is also the front slope of the thoracic hump; this hump considerable and very slightly flattened on dorsum, also slightly compressed laterally behind apex; pupa constricted dorsally behind thorax (segments 4, 5) considerably; segment 6 sloping up again, nearly as high as apex of thoracic hump, segment 7 little lower; the dorsal line of segments 8-11 is at an angle of about 60° with a straight line joining the extreme ends of pupa; that of segments 12-14 is perpendicular to that line; in lateral outline the pupa increases in width from head-frons backward to shoulders, these somewhat prominent and smooth, the pupa becoming first gradually narrower and then again broader in a concave curve to the broadest part about common margin of segments 7 and 8; thence decreasing rapidly in width to form the more or less cylindrical portion composed of segments 10-14, segment 14 being generally broadened out to hinder margin having thus the appearance of a horse's hoof by which the pupa is attached, the "hoof" being provided with hooklets round its extreme margin for this purpose; the ventral line is straight from front to end of wings, then generally bent, forming an angle less than 180° with the longer front portion, to run straight to cremaster. Seen from above the outline is shaped like a fiddle without a handle. Spiracle of segment 2 hardly indicated; the rest of the spiracles longly oval, yellow-brown, situated on the top of little swellings. Surface of body shiny, pitted with a subdorsal, tubercular swelling on segments 6, 7, 8; these swellings or ridges parallel to segment margins and produced laterally down towards spiracles. Colour is as follows:—head, segment 2 and front slope of thorax with wings are enamel-white with a greenish tinge; apex of thorax patched red-brown, behind which the rest of thorax and segment 4 are lighter brown; the abdomen yellow brownish-green with a lateral, black mark on segment 5. Looking at the pupa from above and slightly in front, the shape and markings give the impression of a monkey's face, segment 2 being the mouth, the front slope of thorax the upper lip; the brown spical thoracic patch are the nostrils, the lighter red-brown hinder part of thorax the bridge of the nose, the black spots on segment 5 the eyes and the swollen abdomen at segments 6, 7 and onwards represent the large forehead, the ridges on those segments parellel to segment margins looking like great wrinkles and enhancing the striking resemblance. L: 7mm.; B: 4·5mm. at segment 6/7; H: 4mm. at segment 6= the breadth at shoulders.

Habits.—The eggs are laid singly among the insects upon which the larva feeds; quite a number sometimes to each colony of these. The larva emerging burrows into one of the young lice and eats it up leaving nothing but the covering; this is continued as the larva grows and it is covered by the white excretion of its victims; it lives amongst them and is not always easily distinguished from them; the white covering is attached to the larval skin by the forked hairs or bristles described above. When the caterpillar is

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full grown it is generally found surrounded by the empty skins of its victims and is then not so difficult to distinguish as it is larger and more longly oval in shape. If touched it often falls to the ground rolled up like a wood-louse. The plant-lice generally affect the undersides of the leaves of the plant upon which they live so that the eggs are always laid on the under surfaces of leaves. The pupation takes place on a leaf, often on the upper surface; or on a twig or branch and the white covering is of course cast with the larval skin, the chrysalis not showing a vestige of it. The image is a fast flying little insect and may oftenest be found about the plants bearing plant-lice; these are very easily seen even at a distance being very remarkable from their resemblance to cotton or pure white feathers. It flies erratically, round and about, across and in and out among the leaves and rests nearly always on the upper surface of a leaf with the wings tightly closed over the back but not in the least drawn into each other; the female often rests on a stick or twig, generally with the head pointing downwards. The food of the larva is peculiar, in that it is not vegetable but consists of insects of the family *Coccidæ*. The butterfly is found in Sikkim, Bhutan, Malda, Calcutta, Southern India, Ceylon, Assam, Burma, the Andaman and Nicobar Islands. The race *nubilæ* has been differentiated by Moore from typical *epius*, Westwood as being "much darker brown on the upperside, the apex of the cell with a black spot and no white spot beyond in the male" (supposed to be the Andaman and Nicobar form); but some of the specimens of *epius* from Kanara in the Bombay Presidency agree with it, completely lacking the white spot in the male and being very dark in colour. *Spalgis epius* is found in the mountains and plains, both where the rainfall is heavy and where it is light; it exists from sea-level upwards.

(*To be continued.*)

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THE PALMS OF BRITISH INDIA AND CEYLON, INDIGENOUS AND INTRODUCED.

BY

E. BLATTER, S.J.

PART XVII.

(*With Plates—LXXXIX to XCV.*)

(*Continued from page 538 of this Volume.*)

JUBÆA, H. B. et K. Nov. Gen. et Sp. I, 308, t. 96.
(Etym.: Named after Juba, a king of Numidia).
Mart. Hist. Nat. Palm. III, 294, t. 161, f. 3; Palm. Orbign. 106 (excl. sp.); Kunth Enum. Pl. II, 293.—Philippi Bot. Zeitg. 1859, 362; cat. plant. chil. 301.—Benth. and Hook. Gen. Plant, III, II, 948, 131.

Stem high, unarmed, scaly by the remains of the leaf-stalks. Leaves terminal, pinnatisect; segments patent in all directions, linear-lanceolate, acuminate, rigid, glabrous or pulverulent, the margins recurved, rhachis laterally compressed, convex on the back, acute on the ventral side; petiole unarmed; sheath short, open.

Spadices several; upper spathe complete, fusiform, woody, open on the ventral side, finally bipartite. Flowers on the same interfoliaceous, simply branched spadix, bracteate, male flowers in the upper part, short-pedicellate. Sepals linear-lanceolate, acute, carinate. Petals much larger, ovate or oblong, acute, coriaceous, concave, costate. Stamens 27-30 (according to Benth. and Hook., l. c., 15-30 according to Naudin), inserted at the base of the perianth, included; filaments capillary, longer than the anthers, free; anthers linear, dorsifixed, erect. Female flowers: Sepals broadly imbricate. Petals convolute-imbricate. Urceolus small, membranous. Ovary ovoid, 3-locular, 2 loculi rudimentary; stigmas 3, subulate, patulate.

Fruit obovoid, 1-seeded, provided with the terminal stigmas; pericarp densely fibrous; endocarp bony, globular, acute at both ends, slightly 3-carinate. Seed globose; albumen cartilaginous, equable, hollow; embryo opposite to one of the three pores.

Species 2.

DISTRIBUTION.—Chili, Ecuador.

JUBÆA SPECTABILIS, H. B. & K. Nov. Gen. et Spec. I 308, t. 96; Mart. Hist. Nat. Palm. III, 294, t. 161, f. 3.;-Kunth. Enum. Pl. III, 293.—Gaud. Voyage Bonite, t. 51.—*Cocos chilensis* Molina, ex H. B. et K. l. c. I,

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309, in obs.—*Molinæa micrococcos* Bert. in Mercurio Chileno 1829, anglice in Silliman American Jour. XX., 251.—*Micrococcos chilensis* Philippi in Bot. Zeitg. XVII, 1859, 362; ann. Univ. chil. 1859, 651.

NAMES.—*English*: Coquito Palm of Chili, Coquito nut Palm, Wine Palm of Chili. The fruit: Monkey's cocoanut, [Little coker-nut,], Pigmy cocoanuts, Stanley nuts.

In *Chili*: Palma de coco.

French: Jubée.

German: Syruppalme, Mielpalme, Honigpalme, Chilenische Cocospalme, Coquitopalme.

Spanish: Miel de palmas.

DESCRIPTION.—Trunk stout, swollen in the middle, which in its native country, sometimes attains a height of 40—60 feet. The summit surmounted by a crown of large, spreading pinnate leaves, of a full deep green colour, 6—12 feet long; leaflets 1—1½ feet long, and about 1 inch wide, springing in pairs from nearly the same spot, and standing out in different directions. The leaf-stalks very thick at the base, where they are enclosed in a dense mass of rough brown fibres, which grow upon their lower edges.

Spadices 3—4 feet long, with about 100 branches 1—2 feet long. For details of flower and fruit see description of genus.*

HABITAT.—Chili.

According to Watson in the "Gardener's Chronicle," 2nd November 1895, there is some danger that this palm will soon be exstirpated from Chili, through the wholesale felling of the trunks for the Palm-honey. When Darwin visited Chili in 1832, as recorded in his "Voyage of the Beagle," it was very abundant in the country round Valparaiso, he having counted several hundred thousand trees on one estate alone. The late Mr. John Ball was there in 1882, and although he devotes a considerable portion of his book (Notes of a Naturalist in South America) to the flora of Chili, he does not even

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*For further information on this palm we refer to the following publications:—

Birganti Vincenzo. Descrizione di una nuova varietà del cocos chilensis. Istit Incor. Sir Nat. Napoli Atti V. 256-279, d. pl. (1834).

Wossidlo P. Ueber die Structur der Jubæa spectabilis ein Beitrag zur Anatomie der Palmen. Leop.—Carol. Akad. Naturf. Verh. XXVIII. No. 5 (1861).

Philippi R. A. Phœnix dactylifera, Jubæa spectabilis und Luma cheken. Gartenfl. XXVIII 304—305 (1879).

Regel E. Jubæa spectabilis, Gartenfl. XXXIII, 35 pl. 1145, (1884).

Soehrens F. Le Jubæa spectabilis dans sa patrie. Illustr. Hortic. XXXV 8 9 (1888).

Nardy, in Bull. Soc. Acclimat. Paris, VI (ser. 4) 754- 756 (1889.)

Bergman E. in Jour. Soc. Hort. France ser. 3, XII, d. pl., (1890).

Johow F. Ueber die chilenische Palme. Verhandl. Deutsch. Wiss. Verein Santiago IV, 1900.

Arcangeli G. Sopra una pianta di Jubæa spectabilis coltivata nell' Orto Botanico Pisano Boll. Soc. Bot. Ital. (1901) 34—28.

Interesting notes are found in the "Gardener's Chronicle": V. (1874), 413, with one illustration; ser. 2, XVIII (1882), 401-402; ser. 3, XVII (1895), 518, illustr. 89—90.

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mention the Jubæa. Miss North visited Chili in 1884, and painted a picture on the Jubæa, which is in the Kew collection. "In a place called Salto, one of the most attractive coast suburbs of Valparaiso, there is a valley full of the native palm, Jubæa spectabilis, which used to cover the country forty years ago, but now scarcely a hundred trees remain. They are mis-shapen things, but seem quite in character with the rocky valley they grow in." (Recollection of a Happy Life).

According to Seeman, the Jubæa is cultivated in Colombia and other parts of South America.

USES.—"In Chili", says the treasury of Botany, "a sweet syrup, called Miel de Palma, or Palm-honey, is prepared by boiling the sap of this tree to the consistence of treacle, and it forms a considerable article of trade, being much esteemed for domestic use as sugar. The sap is obtained by the very wasteful method of felling the trees, and cutting off the crown of leaves, when it immediately begins to flow, and continues to do so for several months, until the tree is exhausted, providing a thin slice is shaved off the top every morning, each tree yielding about 90 gallons.

"The nuts are used by the Chilian confectioners in the preparation of sweetmeats, and by the boys as marbles." The seeds are sometimes exported into England, and are known commercially as Monkey's Coconuts or Little Coker-nuts. They are eaten by boys; but no other use seems to be known to which they are put in Europe.

Bertero* wrote as early as 1829: "I conceive it to be useless to speak of the utility and qualities of this tree, since all are acquainted with its abundant fruit, and the syrup (miel de palma) which is used, as also of the several purposes to which it is applicable.

The leaves are employed for thatching. Its extraordinary hard and incorruptible wood may afford great resources, since with the trunk. . . . may be formed tubes and conduits for water, and sewers, an economical method of replacing those commonly used and whose duration is not so certain".†

Gardening in Europe.—The Coquito Nut or Wine Palm of Chili is one of the most interesting of sub-tropical palms. It is a very handsome plant and well adapted for sub-tropical gardening.

The soil for this palm should be a mixture of one-half rich loam, and one-half a compost of peat, leaf-mould and sand. It withstands the winter in the open air near London, in a poor condition,

* List of the plants of Chili, by Dr. C. Bertero; translated from the "Mercurio chileno", and forwarded for this Journal by W. S. W. Ruschenberger, M.D., U. S. Navy. In Sillim. American Journal of Science and Arts, Vol. XX, No. 1, pp. 251-52 (1831).

† Philippi says that the wood is utterly useless. I have not been able to find out which statement is correct.

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but, if grown in tubs in the conservatory in winter, and placed in the open air in summer, it will prove an excellent subject for association with the hardier palms.

The "Gardener's Chronicle" writes in 1895 (Nov. 2nd.): "There is a large healthy specimen of this palm in the temperate-house at Kew. It has a trunk 8½ feet in circumference at the base, and 7 feet at a distance of 5 feet from the ground. It bears a grand head of feather-like leaves, each 17 feet long and 4½ feet wide."

In an account of the Royal Gardens at Lisbon (given at p. 292, Vol. IV., of The Garden) mention is made of a specimen growing there in the open air, which has attained a height of 32 feet, and the trunk of which measures 13 feet 8 inches at its base. In 1886, this identical specimen flowered and ripened fruits. It was then 35 years old, and had a trunk over 16 feet high, and 14 feet in circumference at the base. The plant flowered in January and the fruits ripened the following August.

The tree may be seen thriving in the open air in gardens on the Riviera, a specimen in M. Naudin's garden is 16 feet high, and the girth of the tree at a yard high is more than 12 feet. The age of the tree is 36 years.

A plant was tried in the Bamboo Garden at Kew in 1893, but it succumbed to the first severe frost.

Naudin published some interesting notes on the fructification of *Jubœa spectabilis* in a French Revue* from which the "Gardener's Chronicle" gave the following extracts in February 1895:

"Experiments in naturalisation lately made in France, with the encouragement and aid of the Société d' acclimatation, yield from time to time results theoretically interesting and likely afterwards to be of practical value. Thus, readers may be interested to learn that this year there has flowered and fruited for the first time in France the great Peruvian and Chilian Palm, *Jubœa spectabilis*, an important sugar producer in its native habitats. The tree which fruited at Antibes is over thirty years old. Its height below the crown of leaves is about 5 metres (or 16 feet) and its mighty stem, glossy smooth from the base of the leaves, measures, at the height of a man, 4 meters (13 feet). The crown of leaves is not in proportion to the thickness of the stem, as it does not exceed that of the Date Palm, and is less widely spreading than that of *Phœnix canariensis*. Our tree, says Mr. Naudin, produced two flower spikes springing from the axil of last year's leaves, about 1 metre long, and each bearing several hundred flowers, the males with 15 to 20 stamens, and situated on the upper part of the panicle, the females on the lower part. This species is, therefore,

* Naudin Ch. in the "Revue des Sciences Naturelles Appliquées," November 20, 1894.

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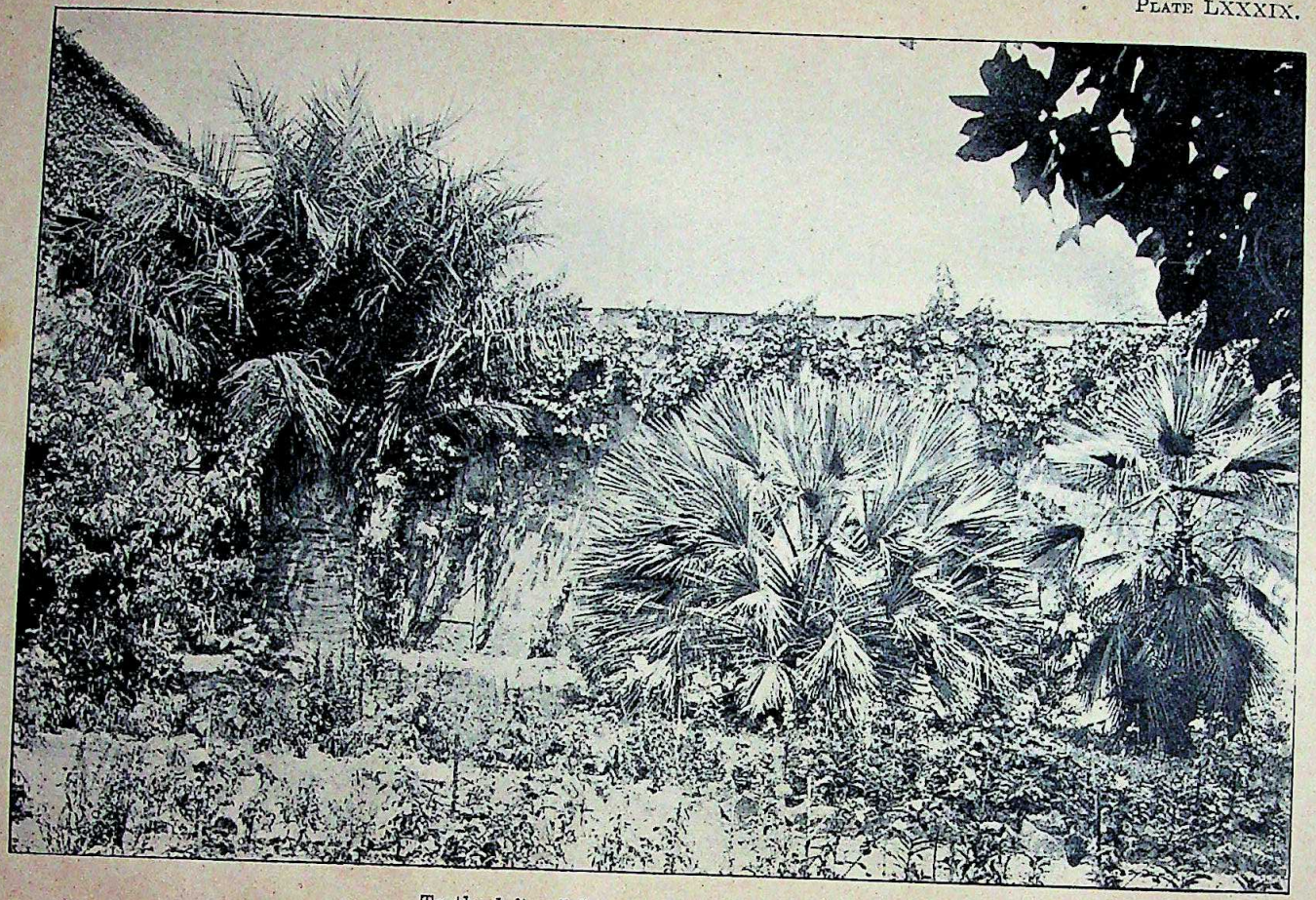

To the left: *Jubæa spectabilis*, H. B. & K.
In the middle: *Erythea armata*, S. Wats.
To the right: *Trachycarpus Takil*, Becc.

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monœcious, and needs no artificial fertilisation. The fruits are almost spherical with a short swelling at the summit; they attained maturity about the end of September and beginning of October. Their size is that of a small apricot, and the colour rather pale yellow; they are composed of a stringy, not edible, husk, and a large seed with a hard shell, and rather oily kernel, with a flavour suggesting that of a Hazel-nut. In the seed-covering were noticeable the three holes characteristic of the cocoa-nut tribe, and through one of which the radicle emerges. When the seed is ripe the husk splits and the seed escapes. Jubæa is one of the hardiest palms known and in this respect is almost equal to the Chamærops of Southern Europe. It has also another advantage: it flourishes in dry soil, if this is of a certain depth, and is able, unlike the Date Palm, to dispense with watering, and therefore grows where the Date does not thrive without expensive artificial irrigation.

"The utility of Jubæa as a sugar-producer is well-established, and the cultivation of it in its native habitats is an important source of revenue. Unfortunately there is often long to wait, even from twenty to thirty years, and, like other trees, it is planted for posterity. As compensation, it lasts for a century, needing no attention beyond the extraction of the sugary sap, cutting the racemes before flowering, or harvesting the flowers if the sugar is not extracted. It should be understood that if cultivation is undertaken, it can only be in Algeria and other places of the same latitude and climate. In France the great Chilian Palm is but a curiosity or ornamental tree."

ILLUSTRATION.—Dr. Beccari was kind enough to send me the photograph reproduced on Plate LXXXIX. On the left there is a specimen of *Jubœa spectabilis*, in the middle of *Erythea armata* and on the right of *Trachycarpus Takil*. The latter was described in our first papers. The palms grow in the garden of the Villa Beccari near Florence.

C. *Sub-tribe*: *BACTRIDEÆ*.

Spadix much branched, or little, or not at all; upper spathe complete, persistent, spiny, bristly or velvetly hairy. Male and female flowers united into clusters of 3 at the base of the branches or spadix, whose upper parts are male. Calyx and corolla of the female flowers in *Martinezia* and *Acrocomia* of 3 leaves, imbricate, in the others the leaves are united. Stigma sessile on the ovary. Endocarp with 3 pits situated obliquely, or symmetrically round at the apex; radicle of the embryo obliquely ascending. Leaf-sheaths, midrib, and often the leaflets, spinous.

Matrinezia, Kth., *Acrocomia*, Mart., *Astrocaryum*, Mey., *Bactris*, Jacq., *Desmoncus*, Mart.

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KEY TO THE GENERA DESCRIBED BELOW:

1. Calyx of the female flowers of 3 leaves, imbricate ... ... *Martinezia.*
2. Calyx 3-dentate ... ... *Bactris.*

MARTINEZIA, R. and Pav. Fl. Peruv. & Chil. Prod. 148, t. 32. (After Francisco Martinez de la Rosa, a Spanish poet and statesman, 1789-1862).

Willd. Mem. 1804, 32.—Gaertn. Fruct. II, t. 139, f. 5.—Kunth Enum. Pl. III., 269, 275.—Mart. Hist. Nat. Palm, III, 283, 322, t. 161, f. 1.—Karst. Linn. 28, 388, 397.—Wendl. Linn. 28, 349.—Walp. Ann. I, 100 f.—Griseb. Fl. Brit. W. Ind. 521.—Drude Bot. Zeitg., 1877, 636, t. 5, f. 10; Flora Brasil. III, II. 392.—Benth. & Hook. Gen. Pl. III, II, 944, 124.

Stem spinous, columnar. Leaves terminal, mostly few, pinnate; rhachis and peduncle spinous; leaflets præmorse, more or less aculeate, spadix from between the leaves, simply branched, spinous; branches with glomerules of 3 flowers, upwards only male flowers, spathes 2, spinous. Flowers monoecious, pale, male larger than the female. Male flowers: calyx tripartite; corolla tripetalous; stamens 6; filaments subulate; anthers erect, linear, acuminate. Female flowers: sepals 3, concave, imbricate; petals 3 concave, valvate; staminodes forming a 6-dentate membranous urceolus. Ovary trilocular, 2 loculi abortive; stigmas 3. Drupe globose, 1-seeded, size of a cherry; sarcocarp fleshy; putamen horny, scrobiculate and rugulose, 3 slightly stellate pores. Albumen equable.

Species 7.—From the Antilles and Columbia to Peru and eastern Bolivia.

CULTIVATION IN EUROPE.—Very ornamental stove palms. They thrive in a compost of sandy loam and peat, in about equal parts, and require a strong heat and an abundance of water. Propagation is effected by seeds.

MARTINEZIA CARYOTÆFOLIA, Humb. & Kth. Nov. Gen. ed. min. I 305, VII. t. 699; Kth. Enum. III. 270; Mart. Hist. Nat. Palm. III, 284, t. 161, f. 1.—*Aiphanes caryotoides*, Hort.

Vern. name in Brazil: Paxiuba Majerona (ex Drude).

DESCRIPTION.—Stem cylindric, 20-30 feet high, 4-5 inches in diameter, annulate, with long, subulate, black spines. Leaves 8-12, slightly arched-patent, 6-8 feet long; petioles at the base broadly lanceolate, semi-amplexicaule, armed with black spines; leaflets straight-patent, cuneiform, lanceolate, margin spinous-ciliate. Spadices, growing from between the lower leaves, 1½ feet long; peduncle slightly terete, 4-6 inches long, erect-patent, compressed angular at the base, unarmed, glabrous. Male flowers: calyx small, tripartite; segments ovate-triangular, acute; corolla 4-times as long

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STEM AND LEAF OF *Martinezia caryotaefolia*, H. & K.

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NAMES.

English : Water-coconut.
Beng. : Gulga, gabna, golphal (fruits) Golpatta (leaves).
Burm. : Dane.
Andam. : Poothadah.
Sing. : Ginpol.
Ceylon : Gim-pol.
Guam and Philippines : Nipa, Sasa.
Ponape : Parran.
Sulu Archipelago : Ballang.

DESCRIPTION.—Rootstock 1½ foot in diameter, rooting along the lower surface. Leaves very many, erect and recurved, 15-30 feet long; petiole 4-5 feet long, very stout, sheath short; leaflets innumerable, shortly decurrent on the rhachis, 4-5 feet long, bright green above, glaucous and 3-keeled beneath, tip subulate, midrib scurfy. Spadix 4-7 feet long, peduncle 3-4 feet. Male flowers very small; sepals linear with clavate inflexed tips; petals similar but narrower—ovary densely crowded, cuneate-obovate, angled, top pyramidal. Fruit 1 foot in diameter, nodding; carpels 4-6 inches long, densely packed on a globose, areolate receptacle, compressed, broadly cuneiform, dark brown, crown 3-or more-angled; seed as large as a hen's egg.

HABITAT.—Sunderbunds, Burma, throughout Malay to Queensland; Ceylon, mouth of rivers on south-west coast, Kalutara, Gindura River near Galle; not in Peninsular India. Thousands and thousands of acres of the salt marshes of the islands and coasts of the Indian Ocean may be seen covered with this palm. It seems to reach its western limit in Ceylon.

FLOWERS in October.

USES.—*The leaves* are used for thatch. For this purpose the leaflets are stripped from the rhachis and formed into a thick fringe on a reed. After having been thoroughly dried the thatch is secured to the framework of the roof by lashings of Pandanus leaves split up to the middle and deprived of their stiff keel. Two men work at a time on each reed, beginning at the eaves and working toward the ridge, which is covered with a sort of braided matting secured in place by pins passing under the ridge-pole and projecting on each side. The Nipa is far superior to and more durable than coconut thatch. Safford describes the preparations which are made for thatching on the island of Guam in the following way. "The housewife begins saving up dulces and other good things months beforehand. The nipa leaves are collected, made into fringe, and allowed to dry. Pandanus leaves are collected and cured and stripped of their spiny-keeled midrib. When all is ready relatives and neighbours are invited to assist, a pig or a bullock is killed, and the work goes

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on amid feasting, tuba drinking, and laughter, with occasional pauses during which Areca nuts, fresh Betel leaves, and lime are passed around on a tray, and the host dispenses cigars, made by the ladies of his family, of tobacco leaves in the form of a cylindrical bundle kept together by a wrapping of pineapple fibre or thread."

In the Philippines toddy or "tuba" is made of the sap of the Nipa, obtained as in the Coconut from the flowering spadix. "This spirit," says Padre Blanco in his "Flora de Filipinas," "preserves, I am told, the sight, if the eyes are washed with it in the mornings; it also imparts an agreeable odour to tobacco and snuff. The inside of the fruit is edible, like that of the Coconut." He mentions the pounded leaves of Nipa as a remedy for the bites of centipedes and a cure for ulcers. When the leaves are burnt they yield a supply of salt. Linschoten, the Dutch traveller, who visited India about 300 years ago, saw this palm and mentions that it yields an excellent wine.

From the leaves hats and cigar cases are made. The old fruits are large, the interior being hard like ivory, but transparent. Kurz thinks the seeds might be used for vegetable ivory.

According to Watt the leaf-stalks are used to help in floating sundri logs in the Sunderbunds, also as fishing floats. Gamble states that the trade in golpatta leaves in the Sunderbunds amounts yearly to about 135,000 tons, valued at nearly Rs. 60,000.

CULTIVATION IN EUROPE.—An ornamental stove palm. It is somewhat difficult to grow. Its pot should be partially or nearly submerged in a tank in which tropical aquatics are cultivated.

ILLUSTRATION.—Major Gage was kind enough to have a photograph taken of the beautiful group of Nipa palms seen on Pl. XCV.

(*To be continued.*)

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A NOTE ON SOME BIRDS OF THE GUJRANWALA DISTRICT, PUNJAB.

BY

HUGH WHISTLER, M.B.O.U.

Gujranwala is the headquarters of a District of that name situated in the Lahore Division of the Punjab.

On the north-east it is bordered for some 80 miles by the River Chenab, which separates it from the Gujrat and Shahpur districts. On the south-east it is divided from the Lahore District by the River Ravi. Geographically as well as physically it lies between the fertile submontane district of Sialkot on the East and the desert of Jhang on the West.

I was posted there from the 26th of March until the 14th of October, 1915. I spent as much of my leisure as possible in that period in collecting and observing the birds in the area round Gujranwala. The notes that were then made are here set on record to be available for those who, at any time, may desire to make a complete list of the birds of the district. I have also incorporated a few observations made during a short visit in the last week of December 1913.

As some excuse for their incompleteness, it may be mentioned that I had hardly any opportunity of moving about the district, and with the exception of two periods of casual leave to the Hills, and a few days on tour, I remained continuously in Gujranwala itself. This is not a profitable field. Gujranwala is famous for its gardens, but the country round is a flat featureless plain of cultivation. On one side runs the main canal, and the plantations along its banks were attractive to migrants, and proved one of my best hunting grounds.

From its position near the Hills, which are visible under favourable conditions, with regard to the north-west corner of the Punjab, Gujranwala may be looked on as well situated for the observation of migration; a longer acquaintance with the district and more opportunities for moving about and collecting might be expected to produce good results.

The famous duck jheel of Hafizabad lies within the district, but I had not a chance to visit it.

The order and nomenclature here adopted is that of Blanford and Oates in the four Volumes of Birds, "Fauna of British India" Series.

1. The Raven—*Corvus corax*, L.

The Raven was common during my stay in the district both in Headquartes at Gujranwala, and at such places as Hafizabad,

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Wazirabad, Sheikapura and Sangla which I had occasion to visit. From July onwards I frequently observed that in the evenings for about an hour before dusk, a number of Ravens, singly, in twos and threes and occasionally in bunches, flighted in a northerly direction across the canal near Gujranwala. These birds, which flew low, at the elevation of the tops of ordinary trees, all followed the same line and were evidently birds which had spent the day scavenging round the outskirts of the city and were returning to spend the night at some roosting colony.

5. The Rook—*Corvus frugilegus*, L.

A winter visitor only to the district; a large number were observed during the last week of December 1913, when I paid a short visit to the station.

7. The Indian House-Crow—*Corvus splendens*, Vieill.

This abundant species is of course resident in the District throughout the year. It breeds in June and July, the best time to find eggs being in the second half of June and the first half of July. The low Kikur plantations which bordered the canal were a favourite nesting ground, and the birds that bred there seemed less troubled by the attentions of *Eudynamis honorata* which deposited their eggs freely in Crow's nests built in the gardens of Headquarters.

9. The Jackdaw—*Corvus monedula*, L.

Found in small numbers in company with the flocks of Rooks during the last week of December 1913.

16. The Indian Tree-pie—*Dendrocitta rufa*, Scop.

Although not uncommon, the wandering Tree-Pie is much less numerous in Gujranwala than in most Punjab stations. This, I presume, is due to the fact that there are but few well wooded gardens while the country round is of the most open character.

The only nest found contained an incomplete clutch on the 1st of August, this was a very small cup of sticks built at the extremity of a thin branch at the top of a "Chir" tree (*Pinus longifolia*) in a garden. The owners of this nest had been seen carrying sticks as early as 5th July. The birds deserted the nest after its examination.

31. The Indian Grey Tit—*Parus atriceps*, Horsf.

First observed on 10th October, and from then common until my departure on the 14th of the month. It is, of course, a winter visitor only to the district, leaving to breed in the Himalayas.

34. The Green-Backed Tit—*Parus monticola*, Vig.

A single individual was noticed in the garden on the 9th of October. I also observed the species during my visit in December 1913.

105. The common Babbler—*Argya caudata* (Dum.)

Common and generally distributed. Nests were found on various dates between 5th of April and 18th of September.

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110. The Jungle Babbler—*Crateropsa canorus* (L.).

Common and resident, being more frequently seen in the gardens of Civil Lines than the last species, which is more a bird of the open cultivation. Some nests were found in June and July.

139. The Yellow-eyed Babbler—*Pyctorhis sinensis* (Gm.).

Not uncommon in the gardens of Civil Lines, where it breeds and is probably resident, I found an empty nest in June, built in the top of a clipped "Sanatta" hedge and another nest containing three fresh eggs on July 28th. This nest was built about 3 feet from the ground in a fork formed by 4 stems of a mulberry sapling in a neglected and somewhat overgrown part of the Sessions Court Garden. The eggs measured respectively 18·5 × 14·5 ; 19·5 × 14·5 ; 17·5 × 14·5 mm.

226. The Indian White-eye—*Zosterops palpebrosa* (Temm.).

Only met with in the district during my visit in December 1913,

278. The Madras Red-vented Bulbul—*Molpastes hæmorrhous* (Gm.).

288. The Punjab Red-vented Bulbul—*Molpastes intermedius* (Hay.).

Both the above forms of Red-vented Bulbul may be expected to occur in the District, but the specimens obtained by me were somewhat intermediate in character with the chocolate ear-coverts of the latter and the sharply defined cap of the former. Anyhow Red-vented Bulbuls are common and resident, while nests were found in May, June and July.

327. The Black Drongo—*Dicrurus ater* (Herm.).

Although this species is common, and occurs throughout the year in the district, its numbers probably decrease during the winter. Many nests were observed in June and July.

363. The Indian Great Reed-Warbler—*Acrocephalus stentoreus* (H. and E.).

Met with on two occasions only ; a male was shot at Kamoke, on 12th May, where it was found in a small patch of thickly crowded saplings by the Grand Trunk Road. The other was a female, and was shot on the 6th of August, as it was hunting for insects at the top of one of the Kikur trees of the plantation by the Canal banks.

366. Blyth's Reed-Warbler—*Acrocephalus dumetorum* (Blyth).

A very common spring and autumn passage migrant, at which periods it may be found creeping about the tops of the trees, or frequenting any available patch of cover, or skulking in the undergrowth. The neighbourhood of water appears to have no special attraction for it. Attention is usually drawn to the bird by its chipping note, but in spring its low and pretty song is frequently to be heard.

On the spring migration, the first individual was noted on the 3rd of April, and it soon became common, and remained so until the middle of May ; all had gone by the end of the month. It was not long absent, however, as I met the first bird of the return migration on 16th July, they did not become common until about the end of the month, but many were seen in August. During the first half of September, I was away in the Hills, but

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observed one on the 24th of the month, and think I heard another on the 27th.

367. The Paddy-field Reed-Warbler—*Acrocephalus agricola* (Jerd.).

A bird believed to have been of this species was seen on 24th August.

374. The Indian Tailor-bird—*Orthotomus sutorius* (Forst.).

A common resident throughout the district, being usually found in gardens. I found two nests with eggs in the hedge of my compound on the 20th and 21st of June respectively. The first contained 3 fresh eggs, and the second a moderately incubated clutch of five.

384. The Rufous-fronted Wren-Warbler—*Franklinia buchanani* (Blyth).

Resident and common; 3 moderately incubated eggs were found in a nest on the 1st of April, and naked young in another nest on 1st July.

394. Sykes' Tree-Warbler—*Hypolais rama* (Sykes).

396. The Booted Tree-Warbler—*Hypolais caligata* (Licht).

An odd Tree-Warbler or two were noted during the spring migration about the end of April and in May. On the autumn migrate specimens of both the above species were obtained. Only two individuals were noted in July; the first was seen on the 8th and shot but lost; the second was shot on July 18th and proved to be a male *Hypolais caligata*.

During August they were common, several parties being observed in the Kikur plantations by the Canal on the 11th of the month. I was away during the first part of September, but after my return I saw a single bird on the 14th of September.

398. The Whitethroat—*Sylvia cinera*, Bechst.

A male was obtained in the Kikur plantation by the canal on 24th of August. On the previous day while returning from Wazirabad by train, I saw what appeared to be an example of these species fly out of a bush on the Railway embankment.

401. Hume's Lesser Whitethroat—*Sylvia althea*, Hume.

An adult female was shot in a row of Kikur bushes on some open fields on September 29th.

402. The Indian Lesser Whitethroat—*Sylvia affinis* (Blyth).

A very common winter visitor to the district from about September until the middle of April. It is extremely arboreal in its habits, and may be most frequently observed creeping about the branches of Kikur trees, searching for insects; during the season when this tree is in flower, many of the Whitethroats are found to have their foreheads yellow with the pollen.

407. The Brown Willow-Warbler—*Phylloscopus tristis*, Blyth.

Observed not uncommonly during the first half of April.

408. The Olivaceous Willow-Warbler—*Phylloscopus indicus* (Jerd.).

on migration. I saw and obtained one specimen, a female, on 28th April.

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421. The Green Willow-Warbler—*Acanthopneuste nitidus* (Blyth).

A female was shot on 28th July.

422. The Greenish Willow-Warbler—*Acanthopneuste occipitalis* (Jerd.).

A few of this species were noticed about on migration during the second half of September.

462. The Streaked Wren-Warbler—*Prinia lepida*, Blyth.

I only observed this small bird in July and August when I found it breeding commonly in the small Kikur plantations which line the main canal near Gujranwala.

The nests were all of the same type; oval, the depth much greater than the breadth with the entrance near the top of the side. One nest measured was 4½ inches in depth and 2½ inches in breadth. They were built of dry shreds and pieces of grass, bound together with bits of vegetable cotton, heads of down, etc.; the inside sparsely lined with down and fibre, this lining being thick and well matted in the lower half of the nest so as to form a comfortable bed for the eggs. All the nests were placed about 2 to 2½ feet from the ground in tufts of coarse grass.

Nests were found as follows :—

6th August.

Four fresh eggs.
Four fresh eggs.
Four rather incubated eggs.

11th August.

Naked young.

15th August.

Four fresh eggs.
Four fresh eggs.

Twelve eggs measured give the following results :—

Length 13 mm. to 14·5 mm.
Breadth 10·5 mm. to 11 mm.
Average 13·8 × 10·8 mm.

464. The Ashy Wren-Warbler—*Prinia socialis* (Sykes).

On my arrival at the end of March this was one of the commonest birds of the gardens of Gujranwala, its loud note and song being heard on every side.

Without regard to unfinished and deserted nests, I made notes of sixteen nests with eggs and one with young. Of these seven were found in June and nine in July, while one clutch of eggs was taken on April 16th. Eleven nests contained clutches of four eggs, four contained clutches of three, while the other two were deserted before the clutch was complete. The nests were of two types; in the composition of the first sewing entered largely; either the nest was placed within the orifice formed by sewing together the edges of one or more leaves, or else it was attached to a large leaf and partly enclosed by the edges of the leaf being folded round it. The plants most used were either Sunflower, Fig. or a species of Bindwood creeper common in the hedges.

The actual nest was a deep cup of fine dry grass stems and roots mixed and lined with a few horse-hairs, all visible portions of the outside and corners of the cavity between the stitches being plastered and stuffed with a rough felting of vegetable

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cotton and fibre and similar materials. The sewing was either a genuine in and out stitch used to draw edges of leaves together, or else the mere pushing of rough knots through punctured holes in the leaf.

The second type of nest was less common and consisted of an oval domed structure of various shapes and sizes with the entrance on one side. This was built in bushes and occasionally steadied by the sewing of a leaf or two to the outside.

All eggs found were of the ordinary mahogany red type; seventeen measured give the following results:

Length 14·5 mm. to 17 mm.
Breadth 11·5 mm. to 12·5 mm.
Average 16 × 12·2 mm.

During the second half of September and the beginning of October the species seemed to become much scarcer, but I was not long enough in the district to ascertain whether this disappearance was real owing to migration or only apparent and due to the ending of the breeding season and I prefer the latter alternative.

466. The Indian Wren-Warbler—*Prinia inornata*, Sykes.

Resident and common. This Wren-warbler is par excellence a bird of the crops and cultivation; for instance, of the birds found in the standing corn in April and May, it was by far the most numerous, while on one evening in August (at Sangla) I found ten of its nests in various stages in patches of growing sugarcane; but all were empty.

The only eggs found were a rather incubated clutch of four taken on 17th July from a nest of the usual type (a domed oval of finely laced shreds of green grass, with a slight lining of horsehairs) built in the top shoots of a roadside "Sanatta" hedge. In the gardens of Civil Lines it was much less common than *Prinia socialis*, which was on the other hand less common in the fields.

469. The Indian Grey-shrike—*Lanius lahtora*, Sykes.

The Grey-shrike is both common and resident throughout the district.

473. The Bay-backed Shrike—*Lanius vittatus*, Val.

Here as in other districts of the Northern Punjab, the Bay-backed Shrike is doubtless very largely migratory, although I was not long enough in the district to mark its exact status. On my arrival towards the end of March the species was common, and I found many nests in March and April; a clutch of three slightly incubated eggs was found on July 23rd. During August birds in the immature plumage were common, and about the middle of September the number of Shrikes was apparently increased by birds from further North migrating Southwards. These birds had gone again by the second week in October. During my visit in the last week of December 1913, only a single individual was observed.

476. The Rufous-backed Shrike—*Lanius erythronotus* (Vig.).

Solitary individuals of this Shrike were noted on the 29th of March, 27th of April, and 4th of May in Gujranwala, and on May 12th at Kamoke.

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479. The Pale-brown Shrike—*Lanius isabellinus*, Ehr.

One was seen at Hafizabad on the 2nd of October ; I think I saw a second specimen at Gujranwala on the following day.

495. The Short-billed Minivet—*Pericrocotus brevirostris* (Vig.).

A winter visitor only and observed in some numbers during the last week of December 1913.

500. The Small Minivet—*Pericrocotus perigrinus* (L.).

One was observed near Sheikhupura on the 18th of May.

518. The Indian Oriole—*Oriolus kundoo*, Sykes.

A common summer visitor first seen on the 15th of April, and observed until the end of August. I have a somewhat doubtful record for the 14th of September.

528. The Rose-coloured Pastor—*Pastor roseus*, L.

A small number of these handsome starlings were seen on various dates from the 16th of April until the 5th of May during the spring migration.

Their return migration commenced in July, the first flock being noted on the 6th instant; from then till the 25th of the month they were fairly common, but after that seemed to disappear again. In September and October an occasional small party was observed.

The Starling—*Sturnus vulgaris* subsp ?

During my visit to Gujranwala in the last week of December 1913 I found Starlings to be fairly common, but no specimens collected for identification.

Otherwise I have no notes for the district, save doubtful records of flocks observed on April 30th, August 8th, 11th and 19th and October 9th. These flocks were observed flying at some distance, and it was impossible to make quite certain that they were composed of Starlings and not Pastors.

549. The Common Myna—*Acridotheres tristis* (L.).

Abundant and resident. As an example of the boldness of these birds, the following is of interest. The punkah in my sitting room was worked by a rope which passed through a small hole in the wall and was pulled by a cooly sitting in the verandah. The hole had been enlarged by the friction of the rope, and in the middle of the wall which was a thick one, there was a large hole; in this whole a pair of Mynahs nested, in spite of the fact that the only entrance to the nest was the hole through which the rope was passing backwards and forwards with uneven action as it was pulled by the cooly sitting outside. The birds, of course, had to make this "passage perilous" incessantly after the young had been hatched.

551. The Bank Myna—*Acridotheres ginginianus* (Lath.).

A pair was seen near Gujranwala on April 15th. Also noted on the Hafizabad side of the district where I saw two birds on August 20th, and several others on October 3rd, as I passed through in the train.

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561. The European Red-breasted Flycatcher—*Siphia parva* (Bechst.).

Passed through in some numbers on the spring migration, when it was first noted on March 27th, and last on the 18th April; though I believe that I saw an odd bird on the 20th of April. On the autumn migration my only record is for 3rd October.

592. The Grey-headed Flycatcher—*Culicicapa ceylonensis* (Swains.).

I obtained a single specimen of this flycatcher on 30th December 1913, in the District Board Gardens, where I had observed it on the previous day; it was frequenting a thick clump of young trees by the Club tennis court.

598. The Indian Paradise Flycatcher—*Terpsiphone paradisi* (L.).

On the spring migration I observed only a single individual on 21st April; it was a male in the chesnut plumage with long tail. Several were noted on the autumn migration on various dates from July 28th to October 10th; I observed none that were in any other plumage than the chesnut with short tail stage

604. The White-browed Fantail Flycatcher—*Rhipidura albifrontata*, Frankl.

A few Fantail Flycatchers were noted during October: the species was observed during my visit to the district in December 1913.

608. The Common Pied Bush-chat—*Pratincola caprata* (L.).

Five of these Chats were noticed on various dates between 20th August and 12th October. A female was seen on March 31st.

610. The Indian Bush-chat—*Pratincola maura* (Pall.).

Noted as follows during the spring migrations, one on April 15th; three together (♂ ♀ ♀) on 17th April, and one on 26th April. Noted as follows during the Autumn migrations, two on September 18th, two on 26th September, one on 3rd October, and one on 12th October.

618. The Pied Chat—*Saxicola picata*, Blyth.

On 20th of August a male was observed from the train between Hafizabad and Wazirabad.

619. The White-headed Chat—*Saxicola capistrata*, Gould.

A male was observed on the 24th of August; the species was also observed during my visit in December 1913.

620. Strickland's Chat—*Saxicola opistholeuca*, Strickl.

First observed on the 15th of August, when I shot a male. Several were met with in September and October.

644. The Indian Redstart—*Ruticilla rufiventris* (Vieill.).

This common winter visitor was noted until well into April the last being seen on 18th of that month. I first observed it again on the 20th of September and it had become fairly general by the end of the month.

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647. The Red-spotted Blue-throat—*Cyanecula suecica* (L.).

The Blue throat was observed on migration as follows :—

April 20th.—Fair number met with in the cornfields over which we were shooting quail.

April 30th.—One found in a bare field.

September 18th.—One seen.

September 26th.—Several found in the crops during a quail shot.

October 2nd.—Two or three observed in the crops at Hafizabad.

661. The Brown-back Indian Robin—*Thamnobia cambaiensis* (Lath.).

This bird is resident and most abundant in Gujranwala where it appears to nest chiefly in the Aloe hedges, in the hollows between the bases of the stiff leaves ; it was found breeding from April to July.

663. The Magpie Robin—*Copsychus saularis* (L.).

One was seen in my compound on 12th April and a female was noted in the garden of the Sessions Court on 10th October.

693. The Western Blue-rock Thrush—*Petrophila cyanus* (L.).

On the 27th March one was observed sitting on an outhouse roof in Civil Lines. It was of course on migration.

720. The Blyth's Baya Weaver Bird—*Ploceus baya*, Blyth.

I did not observe any old or new nests of this species in the district, but am of opinion that a bird seen near the canal on 22nd May was Blyth's Weaver.

734. The White-throated Munia—*Uroloncha malabarica*, L.

This small finch was noted at intervals during my stay in the district and many of its old nests were seen.

775. The Yellow-throated Sparrow—*Gymnorhis flavicollis* (Frankl.).

The Yellow-throated sparrow is a most abundant summer-visitor to this district, and was found to have arrived in full numbers by the beginning of April. They continued common throughout May and June, but very few were observed in July and none at all after that month.

776. The House Sparrow—*Passer domesticus* (L.).

The common sparrow was observed to be collecting in flocks during September.

793. The White-capped Bunting—*Emberiza stewarti*, Blyth.

I shot a female in my compound on the 15th of April, and saw what was probably another there on the 22nd April.

800. The Red-headed Bunting—*Emberiza luteola*, Sparrin.

On the 12th and 13th of August I observed some flocks of buntings about, and one specimen that I procured was found to be of this species.

sp? Sand-martin.—*Cotile* sp?

On the 13th of April I saw one or two Sand Martins by the canal, but did not after that see any until September 20th—28th

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on which days a number usually flighted past my house in company with *Hirundo rustica* in the early mornings flying towards the South-east; from then until my departure on 14th October, Sand Martins were common and widely spread. No specimens were obtained.

813. The Swallow—*Hirundo rustica*, L.

The first Swallow was noted on the autumn migration on 19th July. In August a large number were seen; there was usually a morning flight of birds passing my house in a South-easterly direction, but during a visit to Wazirabad from the 20th to the 23rd of the month, the flights observed were generally in a Westerly direction and in the evening. On the 17th of August, in the course of a train journey from Gujranwala to Sangla, I saw big flocks everywhere along the line.

In September and the first half of October, their numbers seemed to have diminished, but the morning South-easterly flight past my house was still noticed on many days.

During my visit to the district in the last week of December 1913 swallows were noted on two or three occasions, on one of which a large number were found collected by a pond.

818. The Wire-tailed Swallow—*Hirundo smithii*, Leach.

Probably a summer visitor only. Observed from 13th April to 14th October in small numbers only, usually in the neighbourhood of the canal.

Wagtails. The genus—*Motacilla*.

During my stay in Gujranwala, I had but few opportunities of observing the Wagtails, and have in consequence but very incomplete notes. No specimens were collected so the identity of the birds seen was for the most part not ascertained, I will accordingly mass under one head an abstract of my notes:—

April 1st.—One *Motacilla alba*.

April 2nd.—A flight of some 20 *Motacilla alba*, at least one *M. personata*.

April 3rd.—Two Wagtails flying high.

April 4th.—Two Wagtails of *flava* or *citreola* type in a cornfield.

April 5th.—One *M. alba*.

April 14th.—One Wagtail of *alba* type.

April 17th.— A Wagtail heard.

May, June and July.—No Wagtails noted.

August 2nd.—A flock of birds seen flying high appeared to be Wagtails.

August 18th.—At Sangla, a flock of a dozen Wagtails of *flava* type.

August 22nd.—At Wazirabad, a flock passed over in the morning and another in the evening, both probably of *flava* types.

August 23rd.—At Wazirabad, a flight of *flava* types passed over high early.

August 24th.—Many Wagtails seen and heard flying overhead.

August 27th.—Many Wagtails flying about in the early morning.

(August 28th to September 12th.—I was away on leave.)

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September 14th.—Some Wagtails noted flying over.
September 15th.—Many Wagtails of *flava* type about. One *M. melanope.*
September 17th.—Two Wagtails of *alba* type seen and others heard.
September 22nd.—One *M. alba* and one *M. personata* seen.
September 26th.—Two or three Wagtails flying over.
September 27th.—One *M. personata* seen.
October 2nd.—At Hafizabad, many flocks and odd birds, mostly *M. alba* and *M. personata,* but a few *flava* types as well.
October 4th.—Some Wagtails heard.
October 6th.—One *M. personata* seen. A few Wagtails noted flying overhead.

During my visit of the last week of December 1913, *M. alba* and *M. personata* were found to be common and generally distributed.

840. The Tree Pipit—*Anthus trivialis* (L.)

A few were observed on the spring migration in April, none being seen later than the 24th of the month.

On the Autumn migration they were much more numerous. The first were noticed flying overhead on 24th August, and from my return from a fortnight's leave on 14th September they were found to be common until the end of the month. A few were also seen during the first week of October.

847. The Indian Pipit—*Anthus rufulus,* Vieill.

Several were met with in April and appeared to be breeding as a female shot was found to have well developed eggs in her ovary.

848. The Tawny Pipit—*Authus campestris,* L.

Met with in April and again in October.

860. The Skylark—*Alanda arvensis,* L.

Great numbers of larks, apparently of this species, were found in cultivation during the last week of December 1913. Two large flocks, also I think of this species, were seen flying overhead at Hafizabad on the evening of 2nd October.

869. The Singing Bush-Lark—*Mirafra cantillans,* Jerd.

A female with the ovary minute was shot in a Kikur plantation by the canal on 2nd October.

874. The Crested Lark—*Galerita cristata,* L.

Common and resident. I found a fledged young bird crouching on the ground on the 17th April, as the result of much searching and watching of a pair that I suspected to be nesting.

895. The Purple Sun-bird—*Arachnecthra asiatica* (Lath.)

This abundant summer visitor had already arrived when I reached the district at the end of March. It continued common until the end of August, but began to disappear in September, being last noted on the 24th of the month.

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972. The Yellow-fronted Pied Woodpecker—*Liopicus mahrattensis* (Lath.)

Resident and not uncommon.

986. The Golden-backed Woodpecker—*Brachypternus aurantius* (Linn.)

Resident and very common.

1003. The Common Wryneck—*Iynx torquilla*, Linn.

Solitary individuals were met with on the 3rd April and 15th September; the latter was found feeding on the ground in a stretch of bare pasture studded with a few Kikur trees.

1019. The Crimson-breasted Barbet—*Xantholæma hæmatocephala* (P. L. S. Müll.)

Common from April until October, but I do not seem to have observed it during my visit in December; it is possible that the bird is a migrant here as this is very close to its Northern limit which is either here or in the neighbouring district of Gujrat. It does not occur in the Rawal Pindi district, and it is doubtful whether it occurs in the Jhelum district just north of Gujrat.

It was calling freely in April, and a nest with young was found on 24th April. From May onwards it was only heard to call occasionally, and then only feebly.

1022. The Indian Roller—*Coracias indica*, Linn.

Common and resident, but its numbers are possibly increased by immigration during the summer months.

1026. The Common Indian Bee-eater—*Merops viridis*, Linn.

This common summer visitor had already arrived when I reached the district towards the end of March; it continued abundant until the end of August, but began to leave in September, although a fair number of birds stayed on into October. Young birds in the dull first plumage were noticeably common in June.

1027. The Blue-tailed Bee-eater—*Merops philippinus*, Linn.

A certain number of large Bee-eaters were seen during the second half of August, but those actually identified proved to be of the next species. However, I found a party of eight or ten of this species feeding in a field on 15th September. And some Bee-eaters seen at Hafizabad on 2nd October, were from their call attributed to this species.

1028. The Blue-cheeked Bee-eater.—*Merops persicus*, Pall.

Many large Bee-eaters were observed about from 11th August until 8th October, and the majority of them appeared to belong to this species.

1033. The Indian Pied Kingfisher—*Ceryle varia*, Strickl.

Resident and common in suitable localities; often observed at the Canal.

1044. The White-breasted Kingfisher—*Halcyon smyrnensis* (Linn.)

Common and resident. Frequently observed in the roads and gardens of Civil Lines.

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1066. The European Hoopoe—*Upupa epops*, Linn.

Hoopoes were fairly common during my stay, as well as in the last week of December 1913. They appeared to be mostly, if not all, of this race. From July to October there were perhaps some signs of an increase of migrants.

On 20th June, I saw a Hoopoe fly down to the ground outside the padlocked door of a row of servants' quarters and put food into the mouth of a young bird—the said mouth being visible at the bottom corner of the door where a rat had at some time gnawed a bolthole. This is the second occasion on which I have found Hoopoes using the floor of a closed and temporarily abandoned room for nesting.

1069. The European Swift—*Cypselus apus* (Linn.)

Two were seen on the evening of August 25th.

1073. The Common Indian Swift—*Cypselus affinis*, Grey.

Although this Swift may be expected here throughout the year, it seems to vary a good deal in numbers. In April and May it was seen but seldom, but then usually in some numbers. During June, July and August, it appeared to be general but mostly in small parties. September and the first half of October showed a clear decrease, only parties of two and three individuals being met with, although the species was noted on most days, in September, at any rate.

1092. The European Nightjar—*Caprimulgus europæus*, Linn.

I shot a specimen of *Capumulgus europæus unwini* in the Kikur plantation by the Canal on 1st August; it was adult, and apparently a female. Two other Nightjars were seen in Civil Lines on 6th July and 5th August, respectively, and they were probably also of this species.

1104. The Cuckoo—*Cuculus canorus*, Linn.

The Cuckoo appeared as a rains visitor when it was clearly passing through on its autumn migration. Several birds were noted on various dates between the 18th July and the 9th August, the majority of them being met with in the low Kikur plantations that border the Canal by Gujranwala.

Although none were actually seen after the 9th August, I was surprised to hear one calling "Cuckoo," in the District Board Garden on the 12th August; this is curious but I do not think that I was mistaken.

1118. The Pied-crested Cuckoo—*Coccystes jacobinus* (Bodd.)

This handsome Cuckoo was common during the monsoon period; they arrived during the first half of June, and for the first week or two were very noisy and conspicuous while courting was in progress; they appeared to begin their departure in the early part of August and had practically vanished by the end of the month; an odd bird or two may have stayed on into September, but none were noted after 12th September when I returned from a fortnight's leave.

On the 3rd July I found a large naked nestling in a nest of *Argya caudata* built some six feet from the ground in an open

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Citron tree in a garden; with it were two eggs and a small and weakly youngster of the owners of the nest, but they had all vanished on my next visit on the 7th July. The young Cuckoo had also gone by the 14th of July, but he had probably fallen a prey to some marauder. This species has a variety of shrill metallic notes, faintly reminiscent of the Koel's wildest shrieks, but the common call-note may perhaps be expressed by the syllables "Ple-ue."

1120. The Indian Koel—*Eudynamis honorata*, L.

This abundant summer visitor arrived about the middle of April (the first individual being noted on the 10th of that month), and began to leave again in September, but few birds being left by the end of that month. The last that I noted was on the 3rd October. Several eggs were obtained from the nests of *Corvus splendens* in June and July.

1135. The Large Indian Paroquet—*Palæornis nepalensis*, Hodgs.

Common and probably resident.

1138. The Rose-ringed Paroquet—*Palæornis torquatus* (Bodd.)

Most abundant and resident. Breeds about March and April.

1139. The Western Blossom-headed Paroquet—*Palæornis cyanocephalus* (L.)

Single birds were noted on July 8th, 15th, and 16th and on October 6th. I think I heard some about in the last week of December 1913.

1152. The Barn Owl—*Strix flammea*, Linn.

Not uncommon and probably resident. From May to June two or three were living in a small group of palm trees in the Sessions Judge's garden, but I could only find one individual there in August and September. Two or three were also living in or about the Treasury buildings, and they often appeared in my garden at dusk. Both lots of owls were sometimes to be heard calling after dusk during the hot weather.

1157. The Short-eared Owl—*Asio accipitrinus* (Pall.)

A party of some half-a-dozen of these owls were found sleeping in the branches of a Kikur tree by the roadside in the last week of December 1913.

1169. The Dusky Horned Owl—*Bubo coromandus* (Lath.)

Resident and probably not uncommon in the district. I only knew of the presence of one pair in the neighbourhood of Gujranwala itself.

1180. The Spotted Owlet—*Athene brama* (Temm.)

Resident and abundant. A nest with young was found on 15th April.

1190. The Cinereous Vulture.—*Vultur monachus*, Linn.

One was seen on December 26th, 1913, in company with some other vultures.

1191. The Black or Pondicherry Vulture—*Otogyps calvus* (Scop.)

Occasionally observed and probably resident.

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1192. The Griffon Vulture—*Gyps fulvus* (Gm.)

Several Griffons were observed during my visit in December 1913. One was noted on 31st of March.

1196. The Indian White-backed Vulture—*Pseudogyps bengalensis* (Gm.)

This is the common vulture of the district (saving *Neophron percnopterus*) and may be met with at all times of the year, although I do not know of any nesting colony within the limits of the district.

1198. The Egyptian Vulture—*Neophron percnopterus*, L.

Abundant everywhere and, of course, resident.

1203. The Indian Tawny-Eagle—*Aquila vindhiana*, Frankl.

Resident and common, but its numbers probably fluctuate a good deal. During the winter in these parts of India, Eagles become very common, but as the species are difficult to separate when at liberty, it is almost impossible to mark their status and migration properly. There were two old eyries, probably of this species, within a quarter of a mile of Civil Lines.

1207. Bonelli's-Eagle—*Hieraëtus fasciatus* (Vieill.)

Almost certainly resident, and probably not uncommon. I found an eyrie on 1st of April containing a single nestling in down with its feathers and quills just beginning to come through. This eyrie was built about 200 yards from the railway, between it the Great Trunk Road, at about a quarter of a mile from the City. The nest was placed in a fork near the summit of a very large Shisham tree, and was a large structure of sticks, said by the climber to contain half withered leaves of the "beri" thorn, and crow's feathers.

I took the young bird on the 15th April, with some idea of training it to kill hares. It grew into a fine bird, but died of a heat stroke on the night of the 5th July.

Those inhabitants of Civil Lines who keep pigeons and fowls appear to suffer a good deal from the attentions of these fine eagles.

1220. The White-eyed Buzzard-Eagle—*Butastur teesa* (Frankl.)

A common summer visitor which had arrived by the beginning of April. I found a nest with two fresh eggs in it on the 15th of that month. One of these eggs had a very distinct tinge of bluish green, much like an egg of *Bubulcus coromandus*; they measured 46·5 × 38 and 45·5 × 37·5 mm., respectively.

There were still a few of these birds about when I left the district on the 14th October, but the majority had departed.

1223. Pallas' Fishing-Eagle—*Halaëitus leucoryphus* (Pall.)

Occurs and breeds in the district, but I had no opportunity of visiting its haunts.

1228. The Brahminy Kite—*Haliastur indus* (Bodd.)

The Brahminy Kite was not uncommon as a rains visitor when it was found frequenting the rice-fields, although I noticed the first one flying over Civil Lines on 16th August.

The last one was noted on 1st October at Wazirabad.

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1229. The Common Pariah-Kite—*Milvus govinda*, Sykes.

Resident, general and most abundant.

1233. The Pale Harrier—*Circus macrurus* (S. G. Gmel.)

I saw an adult Grey Harrier on the 13th April, and one in the Ring-tail plumage on the 2nd May. Both were probably of this species.

1237. The Marsh-Harrier—*Circus æruginosus* (L.)

A common winter visitor. It was first seen on 15th September and was noted occasionally from then until my departure on October 14th. Harriers believed to have been of this species were seen on 4th and 5th of April.

1244. The Common Shikra—*Astur badius* (Gmel.)

A common resident; it breeds freely in the gardens of Gujranwala and I found the following nests :—

April 19th.—One and two slightly incubated eggs brought in by an orderly who did not understand that I wanted to examine the nests personally. He said that the nests were in a Shisham and a Banyan tree respectively in the District Boad Garden.

May 7th.—Three fresh eggs from a slight, untidy nest of sticks without lining, built about 20 feet from the ground in a small Mango tree by the main road in the D. B. Garden. The nest was found through the noisy behaviour of the birds, though later one of them sat in a neighbouring tree to watch the climber, and made no noise or demonstration.

May 8th.—Five incubated eggs in a rather large but slight stick nest without lining, built about 30 feet from the ground in a small Mango tree, in the midst of orange groves and large trees in the Jail Gardens; the bird was very noisy and agitated while the nest was being examined and made one stoop close to it while the climber was up the tree.

May 13th.—Three nestlings in down in a nest near Kamoke station; the nest was rather a sketchy affair of sticks placed near the extreme central top of a large Shisham—one of a fine Shisham avenue along a short by-road.

July 3rd.—Two fresh eggs in a stick nest probably belonging to the pair whose nest was found on the 8th May, and two of whose eggs left then. Stick nest of the ordinary type placed at the top of a Shisham in the Jail Garden. When we arrived, the female was sitting by the nest and not in it; she became very excited and kept stooping towards the climber, but her demonstrations were greatly hindered by a persistent King-Crow who chased her all the time.

1249. The Crested Honey-Buzzard—*Pernis cristatus* (Cuv.)

On the 17th September I saw what was probably a Honey-Buzzard in the Sessions Court Garden.

1256. The Barbary-Falcon—*Falco barbarus*, Linn.

A Falcon seen on the 3rd April 1915, and another in the last week of December 1913, were attributed to this species.

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1257. The Lugger-Falcon—*Falco jugger*, Gray.

Common and resident; in September a fine pair came two or three times to my house to attack a very tame hand reared Falcon Lugger which I had flying loose at hack, and they were so determined in their onslaught that I finally had to shoot one of them to protect my bird.

1258. The Saker-Falcon—*Falco cherrug*, Gray.

A Falcon attributed to this species was seen in the last week of December 1913. It is doubtless a common winter visitor.

1264. The Red-headed Merlin—*Æsalon chicquera* (Daud.)

Common and resident; at least two pairs bred within a mile of my house; I found the nest of one of them on 6th April containing 4 eggs; two of these were addled and the other two had hatched by next day. I had intended to take the nestlings for training, but they were killed by herd-boys a day or two before we were ready to remove them. This nest was a slight stick structure with a neat and carefully rounded cup lined with fine twigs and a few bents; had I not seen the tail of the sitting bird, should have passed the nest by as not worth examination. It was placed some 25 feet from the ground in a fork towards the end of an upper bough of a medium-sized Kikur standing at the side of the railway line. It was probably constructed by the Merlins and was rather dirty. An old moulted flight feather (of Merlin) was entangled in the side of the nest. On one occasion, when at the nest, I saw the Jack give couple of passing Crows a good buffeting for venturing too near to his tree. The female, when disturbed from the nest, would settle on a dead bough some 50 yards away to watch us and on occasion was rather noisy.

1265. The Kestrel—*Tinnunculus alaudarius* (Gmel.)

Two were seen on the last week of December 1913.

1272. The Southern Green Pigeon—*Crocopus chlorogaster* (Blyth.)

A pair of Green Pigeons seen to fly over the Club on the evening of the 11th July were probably of this species.

1292. The Indian Blue Rock-Pigeon—*Columba intermedia*, Strickl.

Resident and abundant.

1305. The Indian Turtle-Dove—*Turtur ferrago* (Eversm.)

Single birds on migration were seen on 22nd of September and 3rd October. I shot the second one and found it most excellent eating, very rich and juicy.

1309. The Little Brown-Dove—*Turtur cambayensis* (Gm.)

Common and resident.

1310. The Indian Ring-Dove—*Turtur risorius*, (Linn.)

Most abundant and resident; found often in flocks in December 1913. Many nests were found from April to July and two nests were found on 6th and 9th October respectively. I found a clutch of three fresh eggs on May 22nd. This is the first

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instance in which I have found a nest of this species with more than two eggs.

1311. The Red Turtle-Dove—*Œnopopelia tranquebarica* (Herm.)

An abundant summer visitor which had arrived by the end of March when I reached the district; I did not note its departure accurately, but I think that it departs in September. I shot a belated male on 3rd October.

1316. The Imperial Sand-Grouse—*Pterocles arenarius* (Pall.)

A single individual was noted in December 1913.

1321. The Common Sand-Grouse—*Pterocles exustus*, (Temm.)

Many were observed in the course of a day's shooting in the last week of December 1913. Two birds and a party of four were seen at Kamoke on 29th March 1915.

1355. The Common or Grey-Quail—*Coturnix communis*, Bonnaterre.

On the spring migration, I observed Quail about until the 2nd May, on which date, call-birds set out collected some 15 or 20 birds into the few standing crops for us to shoot. As far as I could make out, the number of Quail about on the migration was small, as the native fowlers made poor catches.

On the 18th of August I first observed a Quail, at Sangla and in September there were apparently a good many in the crops, certainly more than there had been in the spring. There were still Quail to be found in October.

1375. The Grey Partridge—*Francolinus pondicerianus* (Gm.)

Resident and common in certain localities. There appeared to be none in the immediate neighbourhood of Gujranwala itself.

1402. The Moorhen—*Gallinula chloropus* (Linn.)

A few were seen from the train between Lahore and Gujranwala on 5th October.

1405. The Coot—*Fulica atra*, L.

A few were seen from the train between Lahore and Gujranwala on the 5th October.

1407. The Common Crane—*Grus communis*, Bechst.

Some flocks of Cranes were seen the last week of December 1913. Four Cranes, which appeared to be of this species, were seen flying eastwards over the Canal on the evening of the 6th October 1915.

1422. The Indian Courser—*Cursorius coromandelicus* (Gm.)

This Courser was found to be common on dry waste ground in the last week of December 1913.

1427. The Small Indian Pratincole—*Glareola lactea*, Temm.

A flock was observed on some flooded fields on the Gujranwala side of Wazirabad by the railway on 17th August.

1429. The Pheasant-tailed Jacana—*Hydrophasianus chirurgus* (Scop.)

On 26th August, one was reported to me as having been seen in a rice-field.

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1431. The Red-wattled Lapwing—*Sarcogrammus indicus* (Bodd.).

Abundant, generally distributed and resident. I found two nests as follows :—

13th May. Kamoke.—3 hardset eggs in a slightly heaped-up ring of small lumps of earth, mixed with a few straws, etc., all apparently collected by the bird. This nest was placed in one of the small irrigation squares, lying fallow, by a well, some 70 yards from the Rest-house. The bird walked away quietly from the nest, but became noisy when it was interfered with.

20th August. Wazirabad.—Two hardset and one addled egg from a nest on a small raised hump on sandy ground. The nest was a banked up hollow of small dry bits of earth. The bird walked away from the nest and did not make much fuss when it was touched.

On the same day, from the train, I saw a pair running, with a young bird about the size of a common Sandpiper.

1433. The Yellow-Wattled Lapwing—*Sarciophorus malabaricus* (Bodd.).

A flock of Plover seen on some dry sandy ground in the last week of December 1913, was possibly of this species.

1436. The Lapwing or Peewit—*Vanellus vulgaris*, Bechst.

A flock was seen in the last week of December 1913.

1457. The Black-winged Stilt—*Himantopus candidus*, Bonn.

A single individual was first seen on 3rd August; after that until my departure on the 14th October, I saw several including, on 13th August, a party of twelve. The majority were met with in the flooded fields of growing rice.

Two were observed in the last week of December 1913.

1460. The Common Sandpiper—*Totanus hypoleucus*, L.

First observed on 18th July when a couple were found feeding along the edges of the Canal; another single bird was observed on 24th July and some more on 27th July.

Two were seen on 20th September.

Apart from the above records none were definitely identified and the species was clearly much less abundant than the two following species.

Some were noted in the last week of December 1913.

1461. The Wood Sandpiper—*Totanus glareola*, Gm.

Chiefly, if not entirely, a spring and autumn passage migrant. On the spring migration three were seen on an irrigated field on the 28th April and what was apparently a Wood Sandpiper was seen at Hafizabad on 6th May.

On the return migration I met with a small flock of 6 or 7 on some irrigated rice-fields on 2nd and 5th July and flock of some 15 or 20 individuals in the same place on 16th July. From this time onwards until the end of the month, they were common on the rice-fields, often being met with in flocks and greatly outnumbering the Green Sandpipers. During August they remained common, but decreased again by September. One was seen at Hafizabad on 2nd October.

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1462. The Green Sandpiper—*Totanus ochropus* (Linn.).

A common winter visitor and spring or autumn passage migrant. It was latest seen at Kamoke on 12th May.

The first birds of the autumn migration were seen on the 2nd July and the species became very common in the rice-fields during July and August. By September the passage birds seemed to have passed away leaving only those birds who intended to remain throughout the winter.

1464. The Redshank—*Totanus calidris* (L.).

A flock of Waders seen from the train between Gujranwala and Wazirabad on 27th March, appeared to belong to this species.

1465. The Spotted Redshank—*Totanus fuscus* (L.).

A flock of Waders seen from the train on 3rd October between Hafizabad and Wazirabad was attributed to this species.

1466. The Greenshank—*Totanus glottis* (L.).

A common winter visitor; it was last noted on 2nd May and the first bird of the return migration was seen on 2nd July.

Sp.? Stint—*Tringa* sp.?

Small parties of Stints were seen at Gujranwala on 27th July and between Sangla and Wazirabad on 20th August.

1484. The Common Snipe—*Gallinago cœlestis* (Frenzl.).

On the 21st May I saw a small wader, apparently a Snipe or Jack Snipe flying high against a stiff wind in the middle of a dust-storm. On 3rd August I saw, what was almost certainly a common snipe flying high overhead; I marked it down into a rice-field but failed to flush it again.

1490. The Laughing Gull—*Larus ridibundus*, Linn.

A bird seen flying high northwards over Gujranwala on the evening of 7th August was attributed to this species.

1499. The Gull-billed Tern—*Sterna anglica*, Mont.

This species was noted as follows in Gujranwala. Some were seen by the Canal on 18th July, and two were seen on 13th August. A flock of about 20 were seen flying low over my garden in an easterly direction on the evening of 16th August.

1503. The Indian River Tern—*Sterna seena*, Sykes.

This common Tern may be found throughout the year, but its numbers seem to vary a good deal and it moves about freely. In July and August numbers were seen to pass high over Gujranwala in the mornings and evenings, flying roughly either north or south, the time of day making apparently no difference to the direction. These birds must have been passing between the Chenab and Ravi rivers, but the flight in all probability had also some migrational significance, as only occasional passing birds were noted in the other months.

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1504. The Black-bellied Tern—*Sterna melanogaster*, Temm.

Common and resident, breeding like the last species on the Chenab and Ravi rivers; I saw, however, but few individuals during my stay in the district.

1510. The Little Tern—*Sterna minuta*, Linn.

One was seen at Wazirabad on the Palkhu Nallah on the 21st May.

1517. The Indian Skimmer or Scissor-bill—*Rhynchops albicollis*, Swains.

Five were seen on the Palkhu Nallah at Wazirabad on 20th August.

1517. The Little Cormorant—*Phalacrocorax javanicus* (Horsf.).

A Cormorant seen flying by the Canal on the 24th July was apparently of this species.

1542. The Black Ibis—*Inocotis papillosus* (Temm.).

A long line of about 50 Black Ibis were seen flighting shortly before dusk on the evening of 21st April: they were in crescent formation with the horns of crescent pointing forwards. One was seen at Sheikhupura on 17th May.

1545. The Spoonbill—*Platalea leucorodia*, Lind.

Two large birds, which appeared to be Spoonbills, passed high over my house on the early morning of 31st July, flying in a southerly direction.

1546. The White Stork—*Ciconia alba*, Bechst.

Two were seen near Kamoke on 29th March and one near Eminabad on the 14th April. On the return migration, three were seen from the train between Sangla and Wazirabad on 20th August: a flock of large birds, 15 or 20 in number, seen in the distance on 26th September was perhaps of this species.

Single birds were seen on 3rd and 5th October near Hafizabad and Muridke, respectively, while two were seen from the train between Gujranwala and Lahore on 14th October.

1548 The White-necked Stork—*Dissura episcopus* (Bodd.).

One was seen from the train between Gujranwala and Kamoke on 29th March. One was seen on some flooded rice-fields in Gujranwala on 5th July. Two were seen from the train near Akalgarh on 3rd October, soaring in the sky with some vultures,

1554. The Eastern Purple Heron—*Ardea manillensis* (Sharpe.).

Single Herons, almost certainly of this species, were seen from the train between Gujranwala and Lahore on 29th March and 27th August.

1555. The Common Heron—*Ardea cinerea*, Linn.

An occasional Heron was observed in March, April, May, August, September and October; it was also noted in the last week of December 1913.

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1561. The Little Egret—*Herodias garzetta* (Linn.).

Observed about in small numbers in July, but it was, I think, less common than the next species, from which it is with difficulty distinguished when on the wing; it was not definitely identified in any other month, but some of the parties of Egrets met with from June to October may have been of this species.

1562. The Cattle Egret—*Bulbulcus coromandus* (Bodd.).

A few were noted from May to September in which latter month they became rather common in the rice-fields. By that time they retained but few traces of the buff breeding plumes.

1565. The Pond Heron—*Ardeola grayi* (Sykes.).

Resident and common; its numbers seemed to increase about June but this was probably due to birds collecting for breeding.

1568. The Night Heron—*Nycticorax griseus*, Linn.

The Night Heron was not uncommon in Gujranwala in July and August. Apart from those two months I only saw a party of four on May 2nd at Nayanwali village towards Wazirabad, and heard one call on the night of 29th March.

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A CATALOGUE OF NEW WASPS AND BEES (*FOSSORES, DIPLOPTERA* AND *ANTHOPHILA*) DESCRIBED FROM THE INDIAN REGION SINCE 1897.

BY

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PART II.

(*Continued from page 560 of this Volume.*)

DIPLOPTERA.

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Note.—Species underlined are previously known ones.
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* New to the region.
† Omitted by Bingham.

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P. repentens, Nurse, p. 535, do. do. do.

* New to the region.

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H. horni, Strand, p. 136, Archives. Naturges, 79A, 1913, Ceylon.
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H. hornianus, Strand, p. 138, do. do.
H. kandycola, Strand, p. 139, do. do.
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* New to the region.

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A. unita, Nurse, p. 558, B. J., XV, 1904, Peshin.

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A. peshinica, Nurse, p. 559, do. do. Peshin.

A. niveobarbata, Nurse, p. 560, do. do. Quetta.

A. cara, Nurse, p. 560, do. do. do.

A. hera, Nurse, p. 561, do. do. do.

A. flavofacies, Nurse, p. 561, do. do. do.

A. marmora, Nurse, p. 562, do. do. do.

A. dolorosa, Nurse, p. 563, do. do. Peshin.

A. collata, Nurse, p. 563, do. do. Quetta.

A. legata, Nurse, p. 564, do. do. Peshin.

A. biemarginata, Nurse, p. 564, do. do. do.

A. flagella, Nurse, p. 565, do. do. Quetta.

A. satellita, Nurse, p. 566, do. do. Peshin.

A. cineraria, Linn,†noted by Nurse, p.557, do. do. Kashmir.

A. pilipes,‡ Fabr., noted by Nurse, do. do. do. do.

A. spinigera,‡ Kby., do. do. do. do. Quetta.

A. connexiuscula,‡ Kby., do. do. do. do. Kashmir.

A. tenuis,‡ Mor., do. do. do. do. Peshin.

A. parvula,‡ Kby., do. do. do. do. Baluchistan.

A. nigriceps,‡ Kby., do. do. do. do. do.

A. minutula,‡ Kby., do. do. do. do. do.

A. ilerda, Cameron, p. 1001, B. J., XVII, 1907, Ferozepur.

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A. rupshuensis, Cockerell, p. 243, Proc., U. S. Nat. Mus., 40, 1911, Ladak.

A. nursei.

A. halictoides, Nurse, p. 566, B. J., XV, 1904.

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NOMIA.

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* Left out by Bingham.
† Noted for the first time in this region.
‡ Known species new to the region.

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N. latispina, Cameron, p. 64, p. IV, fig. 11, Mem. Manch. Soc., XLII (11), 1898, Allahabad.

N. fulvohirta, Cameron, p. 65, p. IV, fig. 9, Mem. Manch. Soc., XLII (11), 1898, Allahabad.

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N. mahratta, Cameron, p. 68, Mem. Manch. Soc., XLII (11), 1898, Bombay.

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N. zebrata, Cameron, p. 248, A. M. N. H., IX, 1902, Barrackpore.

N. frederici, Cameron, p. 248, do. do. do.

N. argentobalteata, Cameron, 249, do. do. Bengal.

N. aureobalteata, Cameron, p. 250, do. do. do.

N. carinicollis, Cameron, p. 251, do. do. Ceylon.

N. albofimbriata, Cameron, p. 252, do. do. Barrackpore.

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N. rothneyi, Cameron, p. 214, do. do. Mussoorie.

N. interrupta, Cameron, p. 215, do. do. Khasia hills.

N. tuberculata, Cameron, p. 215, do. do. do.

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N. nasicana, Cockerell, p. 221, do. do. do. India.

N. karackiensis, Cockerell, p. 222, do. do. India.

N. albolobata, Cockerell, p. 225, do. do. do.

N. flavolobata, Cockerell, p. 226, do. do. do.

N. parcella, Cockerell, p. 227, do. do. do.

N. virgata, Cockerell, p. 229, do. do. do.

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* New to the region.

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N. perlucida, Cockerell, p. 232, do. do. do. N. W. India.
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N. butteli, Friese, p. 85, do. do. do.
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N. ceylonica, Cameron, p. 123, Mem. Manch. Soc., XLI (4), 1897, Ceylon.
N. beata, Nurse, p. 543, A. M. N. H., XI, 1903, Kashmir.
N. radiata, Nurse, p. 544, do. do.
N. arida, Nurse, p. 544, do. do.
N. decorata, Smith, ♂—Nurse, p. 543, A. M. N. H., XI, 1903.
N. flavozonata, Nurse, p. 148, J. A. S. B., LXX, 1901, Ferozepur.
N. lucilla, Nurse, p. 149, do. Simla.
N. priscilla, Nurse, p. 150, do. Deesa.
N. detecta, Nurse, p. 571, B. J., XV, 1904, Quetta.
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N. coxalis, Mor.†
N. distinguenda, Mor.†
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* New to the region.
† Known species but new to the region.

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N. sub-petiolata, Smith is not *N. adusta, Bingh*, Cockerell, p. 98, A.M.N. H., XII., 1913.
N. wickwari, Meade Waldo, p. 99, A.M.N.H., XII, 1913, Ceylon.
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OSMIA.

O. gulamargenis, Nurse, p. 545, A.M.N.H., XI, 1903, Kashmir.
O. kashmirensis, Nurse, p. 546, do. do. do.
O. sponsa, Nurse, p. 573, B.J., XV, 1904, Quetta.
O. balucha, Nurse, p. 573, do. do.
O. sita, Nurse, p. 574, do. do.
O. anonyma.
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* New to the region.
† *T. testaceicorne* omitted in the Key.

(*To be continued.*)

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THE GAME FISHES OF THE PERSIAN GULF.

BY

MAJOR W. H. LANE.

PART I.

"Few regions on the globe can shew so remarkable a variety of fishes as India. The waters, salt and fresh, fairly teem with them."

CHARLES FREDERICK HOLDER IN "THE GAME FISHES OF THE WORLD."

It is a well-known fact in the annals of sea-angling that the great gulfs of the tropical and temperate oceans abound with a variety of piscine life that is bewildering in its diversity. The reputation of the Gulf of Mexico and the Gulf of California is world-wide. The tuna and tarpon are household words amongst every community of fishermen; but a casual glance at a book such as *The Game Fishes of the World* by Charles Frederick Holder, LL.D., will suffice to shew that the number of other sport-giving varieties is legion. It is remarkable that in this comprehensive volume not a single word is mentioned of the game fishes to be found in the Persian Gulf. The reason is obvious. From an ichthyological stand-point practically nothing is known of this vast arm of the Indian Ocean. Is there any adequate reason why this huge inlet should not furnish a paradise for the disciple of Izaak Walton? It is with the object of elucidating this problem that the present paper has been written. No claim can be put forward that it is in any way a scientific treatise; lack of technical training on the part of the author would preclude such a supposition from the very outset. Similarly it is not maintained that investigation has by any means been completed. In the waters of this extensive basin an enormous field for work lies in front of the professional scientist. The amateur, however, has his uses; he is frequently the pioneer who pilots the expert to the hidden treasures which he has discovered. It is hoped, therefore, that the contents of this paper may be such as to induce some qualified naturalist to undertake systematic research in the waters of the Persian Gulf.

The initial problem that usually confronts the explorer is—choice of locality. In the present instance the choice of locality was dictated by a benevolent Government, and was contained in the four letters

JASK.

No great effort at word-painting is required to portray this little speck of British dust. Jask is a spit of sand and rock that protrudes its barren dreariness into the Gulf of Oman, but from a piscatorial point of view this physical feature forms the foundation upon which the importance of Jask is built. Against the eastern shore of the promontory the deep and pellucid waters roll straight from the heart of the Indian Ocean without let or hindrance. The 15 knot liner or trooper proceeding up Gulf from the Gateway of India, after rounding the Prongs, lays a direct course to a point 5 miles south of Cape Jask. So it is also with the pelagic fishes; at the appointed seasons they set their noses Jaskwards. Here the five fathom line lies within a few cables distance of the fringe of diminutive cliffs that back the stretch of yellow sand in East Bay. Here the monsters from the open sea, although within close proximity to land, can still revel in the clear cobalt of the watery waste in which they have their being. What is the magnet that attracts the leviathans to this particular locality? There must be hundreds of other haunts where conditions would

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appear to be equally favourable. Yet why is Jask the Rome of the finny tribes to which all the watery ways would seem to lead? There is a law of Nature with regard to the fishes of the open sea which is as unalterable as the ancient law of the Medes and Persians:—

"Where the minnows are there will also be found the Tritons."

To the west of Jask stretches a broad bay of shoal water, with a sandy bottom, the maximum depth of which would be about 30 feet. This bight furnishes an ideal spawning-ground for the minnows. From October till March the mullet comes in in its troops to spawn; and acres of white-bait (locally termed *matoot)* blacken the surface of the sea. These pigmies are harassed mercilessly; they are attacked by the Tritons beneath the waves; they are slaughtered from the air by the gulls and terns; they are massacred from land by man in millions in his drag-nets. In March the remnants vanish, split up into scattered bands; yet year by year about the close of September they return in their trillions. So it is with the the sardines; as far as the naked eye can see the surface is one continuous shimmer as if it were being stirred by a gentle zephyr. Anon they have vanished from mortal ken. Similarly in the first month of spring the "morán" (a species of fish that will be described later) arrives in countless hosts. Of an evening in mid-April from the extremity of Cape Jask for three-quarters of a mile along west bay and to the breadth of a couple of furlongs stretches a chaotic turmoil of leaping and splashing fish and flitting shimming "morán." The sea is thick with "morán"-spawn; it clings to the line in glutinous masses, to be removed when dry with the aid of a pair of scissors. By the close of spring hardly a ring breaks the placid surface which a few days previously resembled a seething cauldron. The "morán" are lying further off-shore. By the end of summer they have vanished, their places being taken by another species of the same fish but in far fewer numbers. Thus it is with them all; whence they come and wither they go no one knows, except that they come from and return to—"the open sea"; an indefinite enough term in all conscience; for the open sea is practically limitless!

To prove successful as a sea-angler four important maxims must be closely studied:—

(1) Get a firm grasp of the habits and nature of the particular fish in quest.
(2) Determine the method which will present the lure in the most natural way.
(3) Ascertain what pattern of lure is most deadly.
(4) Select the most suitable tackle.

The pioneer starts with an enormous handicap; he sets out in a fog, for he has to *discover* for himself these four fundamental principles. This initial lack of knowledge entails the adoption of one of two plans. Either the nomad must maintain a stock of tackle ranging from a trout-fly to a 3 inch forged steel tarpon hook, or he must be prepared to cable for requisite articles as his exploration progresses. Both courses are shockingly expensive, but the former expedient is the most advantageous from the point of view of sport, for if the latter line of action be followed the cream of the fishing may be missed and the entire *raison d'être* of the expedition rendered abortive.

It is proposed primarily to introduce the reader to such of the game fishes of the Persian Gulf as have come within the personal cognisance of the author, and subsequently to discuss the remaining three truisms already enumerated.

To facilitate investigation the fish will be divided into three groups:—

(*a*) Surface-feeders. | (*b*) Fly-takers. | (*c*) Bottom-feeders.

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A key is appended for ready reference.

KEY TO THE GAME FISHES.

Family I.—CARANGIDÆ.

Synopsis of Genera.

1. *Caranx.*—Lateral line wholly or only partially formed of plate-like scales each of which is armed with a lateral spirate keel.
2. *Chorinemus.*—First dorsal formed of isolated spines; posterior rays of dorsal and anal fins in the form of finlets.

Genus 1.—CARANX.

Synopsis of Species.

1. Pirao. *Caranx jarra.*—One row of sharp conical teeth in both jaws conical teeth on gullet; head and back greenish, belly white.
2. Gishran. *Caranx nigrippinis.*—Very similar in appearance to pirao; eye larger; anterior dorsal deep black, lobes of caudal tipped black.
3. Shahbeni. *Caranx malabaricus.*—Sides above and below lateral line marked with lemon yellow spots about the size of a pea.
4. Dubsi. *Caranx carangus* (?).—All fins brightly marked with lemon yellow.
5. Papeel. *Caranx gallus.*—Long streamers to posterior dorsal and anal fins.
6. Kush*. *Caranx ciliaris* (?).—Villiform teeth both jaws: band of steely blue runs from eyes to caudal above lateral line.
7. Kobdar*. *Caranx speciosus* (?).—Very similar to Kush; no teeth on jaws or palate; caudal and all fins tinged yellow.
8. Rush*. *Caranx armatus* (?).—First ray of posterior dorsal prolonged into streamer.

Genus 2.—CHORINEMUS.

Synopsis of Species.

1. Saràn. *Chorinemus lysan.*—5 steely blue to grey blotches on the sides about the size of a florin.
2. Zayrpur. *Chorinemus moadetta.*—Very similar to small Sarán; blotches smaller varying from 3 to 6 in each row; a row below lateral line; pelvic faintly tinged with yellow before death.
3. Susansir. *Chorinemus sancti-petri.*—Almost identical with Zayrpur; no blotches below lateral line, and no yellow before death on pelvic.

Family II.—SCOMBRIDÆ.

Genus—CYBIUM.

Synopsis of Species.

1. Surmai or Seer. *Cybium commersonii.*—Typical steely blue wave verticle mackeral marks on sides.
2. Ghobart. *Cybium interruptum* or *guttatum.*—Steely blue spots on sides elongated horizontally.

The Hour probably belongs to this family, genus *Thynnus*, but its identity is undetermined.

Family III.—SPHYRÆNIDÆ.

1. Koot. *Sphyraena obtusata.*—One of the "Barracudas." Dentition formidable; caudal and posterior dorsal tinged with yellow.

* Signifies bottom-feeder.

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Family IV.—POLYNEMIDÆ.

1. Rajgoo or Bamin. *Polynemus tetradactylus.*—Four free pectoral rays reaching to the end of the ventral.

Family V.—PERCIDÆ.

Synopsis of Genera.

1. SERRANUS.—Canines present; a single dorsal fin; three anal spines.
2. LUTJANUS.—Preopercle serrated; generally canines in both jaws, with an outer row of conical lateral ones; single dorsal; anal with 3 spines.

Genus 1.—SERRANUS.

Synopsis of Species.

1. Hamur. *Serranus stoliczkæ*—Caudal rounded; hexagonal marks over body with background of chocolate.
2. Leddum. *Serranus areolatus.*—Similar in many respects to Hamur but caudal emarginate.
3. Bahilool.* *Serranus miniatus.*—Caudal rounded: jaws, inside of mouth, and tongue deep crimson.

Genus 2.—LUTJANUS.

Synopsis of Species.

1. Surkhoo. *Lutjanus argentimaculatus.*—Caudal slightly forked; head almost plum coloured; gill plates, body and tail tinged pink.
2. Tiddler†. *Lutjanus fulviflamma.*—5 golden bars running longitudinally from gill plates to tail: black blotch on lateral line above anal.
3. Kher*. *Lutjanus roseus.*—Very similar to *Surkhoo*, but has caudal rounded.
4. Giddie and Seoa.—Family undetermined.

Family VI.—SCOMBRESOCIDÆ.

1. Kharkoor or Gar-fish. Genus *Belone*, species *Belone annulata* or *choram* or *melanstigma*.—Caudal forked; body attenuated; mandibles on both jaws with sharp teeth; back-bone green.

Family VII.—SQUAMIPINNES.

1. Shungoo*. *Drepane punctata.*—Almost as deep as it is long: upper half marked with black spots; bump over eyes; snout of moderate length; mouth capable of considerable protrusion.
2. Sungser*. *Holacanthus xanthurus.*—Inside gill plates bright gold; gold blotch on caudal.

Family VIII.—SPARIDÆ.

1. Cooper. *Pagrus spinifer.*—A bream, 4 conical incisors in front of both jaws; 2 rows of conical teeth on either side of both jaws; head pinky red; body compressed; male has protruberance over eyes.
2. Dukh Mullah. *Chrysophrys haffara.*—At extremity of either jaw are 4 rodent-like incisor teeth, on either side of upper jaw are 4 rows of dome-shaped crushing teeth ,and 3 corresponding rows on each side of lower jaw.

Tengun ..
Dahi ..
Sukhulla ..
Tulloo ..
} Families undetermined.

SURFACE-FEEDERS.

There is one family of surface-feeders which stands out pre-eminently above all others in its sport-affording propensities and that family is the

* Signifies bottom-feeder. † Signifies fly-taker.

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CARANGIDÆ.

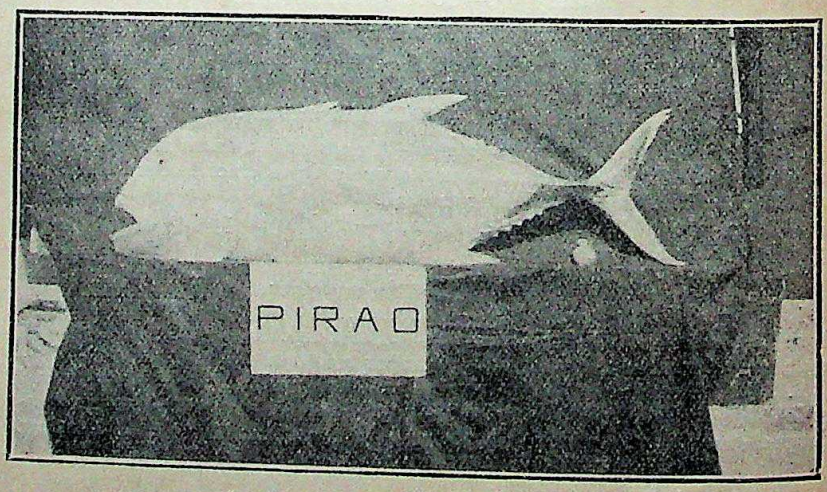
Day divides this family into 13 genera, of which the genus *Caranx* must be granted precedence. The genus *Caranx* is again sub-divided by Day into 26 individual species. There are several of these species that most emphatically come under the category of "game fishes," but the king of this finny tribe as far as Jask is concerned at any rate, is unquestionably the

PIRAO. *Caranx jarra.*

The accompanying photograph gives a good conception of the shape and contour and massive proportions of this portly, though none the less active gentleman. Note the cavernous mouth which would accommodate one's two fists with ease. Mark the depth of head and masses of muscles which furnish the jaws with such enormous crushing power. Study the ample girth. The largest specimen that has been taken at Jask on rod and line weighed 68 lbs. and the measurements of this Goliath are of more than passing interest :—

Length to tip of tail	4 ft. 1½ inches.
Girth	36 inches.
Time estimated at	1¾ hours.

A girth of 36 inches for one of God's creatures whose weight is only 2 lbs. under 5 stone. Just think of it! Look at the broad sweep of the tail; does not the build denote driving force of immense proportions? Ponder over these and other attributes, and then pass judgment whether the Pirao is not a fighter worthy of the best traditions of the race of game fish. Ay, game he is to the last ounce of vitality, for when he comes to gaff and is slipped over the gunwhale to his last resting place at the bottom of the dinghy not a move denotes that he is passing from the land of the living. He pays his debt to nature like a warrior.



PIRAO. *Caranx jarra.* 54¼ lbs.

Description. *Teeth.*—Both upper and lower jaws are furnished with a row of sharp conical teeth supplemented by villiform teeth. There is an elongated crushing pad on each palatine containing small villiform teeth, with a small patch of villiform teeth on the vomer. The tongue, which is very pronounced, is apparently devoid of villiform teeth. There are sharp

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conical teeth on the gullet, both on the upper and lower surfaces, of the same description as those on the jaws, and small villiform teeth on the gill-fringes. Both jaws are provided with lips which are slotted on the inside; the conical teeth fit exactly into these slots; the lips are moveable. When the lips are not drawn outwards the large canine teeth are barely visible. This feature is worthy of remark.

Colour.—Head and back greenish, belly white, and sides iridescent. The white of the sides varies with different specimens. In some it is clean, while in other types it is distinctly dirty; in fact the latter fish are darker in shade all over. This difference in the degree of shade is probably due to environment; the light Pirao would obtain his brighter line from lying over sand in shallow water whereas the more sombre-coloured individual would hale from deep water. A similar phenomenon is quite common in the small burns of the Highlands. The lively yellow creature "bedropped with crimson hail" is snatched from the shallows. His negro-tinted brother is dragged from some deep hole or overhanging bank. It was frequently surmised whether the dusky Pirao was a recent arrival from the open-sea, where his drab colouring would harmonize with the twilight of his abysmal surroundings. This conjecture is probably substantially correct.

Eye.—Large; iris partly coloured golden, with distinct adipose lid situated posteriorly.

Lateral line.—Starts from the upper termination of the gill-opening, sweeps in a low arch downwards to a point vertically above the base of the anal fin, whence it continues straight to the fork of the tail. At the commencement of the straight portion the lateral line is composed of hard scales in the form of plates or shields which increase in size and substance as they approach the caudal fin. At a distance from the fork of the tail equal to about half the depth of the fish the shields develop into a most pronounced and well-defined keel which terminates at the root of the caudal fin in a series of jagged bony or horny cusps. Thus the free part of the tail instead of being compressed vertically to correspond with the lobes of the caudal fin are flattened horizontally.

Scales.—The body is covered with small scales, but these are absent on the central line of the head from the crown to the snout.

Fins.—*Anterior dorsal* consists of four strong spines connected by a thin transparent membrane. The most anterior spine originates as two separate spines, but these unite towards their extremities into one composite spine. The anterior dorsal fin fits into an exquisitely fashioned slot, so that when the fin is closed the anterior spine lies flat with the back and exactly fills up the top of the cavity.

Posterior dorsal.—A firm connected fin without defined spines, curving back to a length equal to about $\frac{1}{2}$ the depth of the fish.

Anal.—Length and appearance similar to the posterior dorsal, but situated slightly nearer the tail; both the posterior dorsal and the anal fins are continued towards the tail by a connected fringe which terminates in a slightly elongated piece of cuticle at the point where the lateral line merges into the lateral keel. Situated anteriorly to the anal fin, and at a distance from it equal to about $\frac{1}{3}$ or $\frac{1}{4}$ of the length of the posterior dorsal, are two small sharp spines.

Pectoral.—A long, narrow, delicate, falciform fin about equal to the depth of the fish. The fin-pit is marked by a black blotch.

Caudal is forked and about equal in spread to the depth of the fish.

Anus is situated closer to the pelvic than to the anal fin.

Opercular spot absent.

Remarks.—It will be noticed that Day states that *Caranx jarra* is provided with villiform teeth on the tongue, whereas they would seem to be absent

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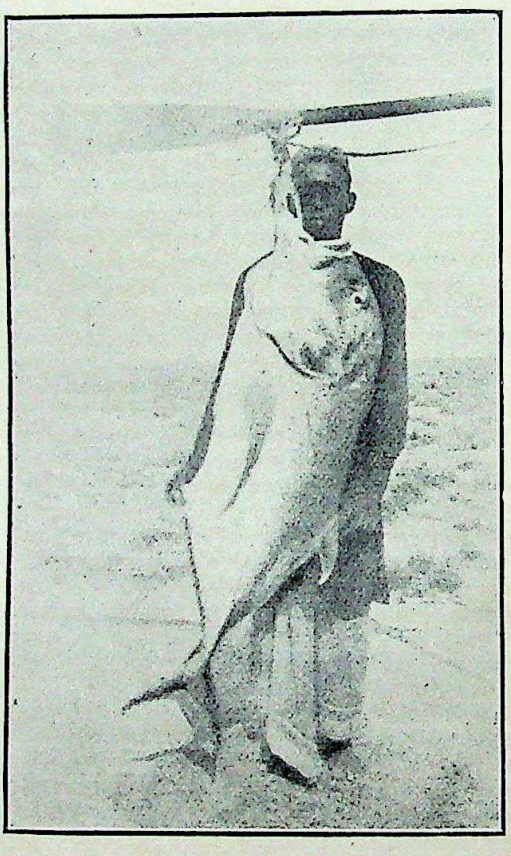
in the Pirao; this divergence of opinion requires settlement. As regards the question of the maximum weight attained by the Pirao, there is no reason to suppose that a hundred pounds is in any way an exaggerated estimate. In fact the locals assert that 120 lbs. would represent the limit of its growth.



PIRAO. *Caranx jarra*. About 68 lbs.

Let us now turn to a brief scrutiny of the habits and spo ing proclivities of this giant *Caranx*.

Experience with rod and line has proved that the Pirao arrives in Jask waters about the beginning of October and disappears about the close of April. A few isolated fish may visit Jask, or more probably remain at Jask, during the intervening period; but their numbers are a negligible quantity. The staple diet of the Pirao is the mullet in the shallows, and probably the flying fish in the open sea, but the patriarch is not particular as to the size or the class of its menu. The author has caught a 60 lb. Pirao on a mullet not more than 5 inches in length. On another occasion a companion was playing a small Sarán of about 4 or 5 lbs. in weight which he had hooked, when it was seized by a marauding Pirao, with the result that a break was recorded *instanter*. In this case the identity of the corsair was fully established, for the somewhat incensed angler rowed up to the scene of the piracy, and distinctly saw the Pirao wallowing on the surface of the water with its wretched victim struggling helplessly between its jaws.

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In fact so absorbed was the filcher in its ill-gotten plunder, that one of the boatmen nearly succeeded in driving the gaff home! Another fisherman, a good and true sportsman, now, alas, numbered in the Nation's roll of honour, had a similar experience. He, likewise, had hooked a small Sarán of a few pounds in weight, which was in turn seized by some finny behemoth; the monster ran out the 200 yards of line without a check, broke it at the knot, and left the angler in a state of wrathful indignation.

Experience has proved that the *habitat* of the Pirao varies at different periods of the cold season; this change of location may possibly be due to the temperature of the water. Thus in October and November the Pirao should be sought for in 15 to 20 fathoms of water. In December and January the Pirao is more often captured close in shore in 3 to 6 fathoms, and in April and May he is occasionally taken by the locals actually from the rocks at the extremity of Cape Jask.

As a general rule the Pirao grabs the lure with the speed of a torpedo; up from the deeps he flashes and turning instantly down he dives to his favourite haunts. At other times the luscious morsel glides unostentatiously into his capacious maw. Do not let the novice be deceived by this mincing manner—the term can also be taken in its culinary sense. When the restraint caused by the line is realised, for the prick of the hook must be an every day sensation judged by the spinous anatomy of its customary food, that stupendous rush for liberty will follow as surely as night follows day. The angler will be well advised to make no attempt to check this mad flight; if such an essay *is* made, fish and fisher will certainly sever an all too transient acquaintance.

The Pirao when hooked, invariably heads for the open sea and he must be followed *nolens volens*. Often and often has the author, after a furious fight, found, when the gaff strikes home and the stars are blazing in all their brilliance, that the dinghy has been towed fully two miles out from shore, and his only guide homewards is the yellow gleam of the Telegraph light. As the oars plash through the glowing phosporescence this game Paladin may utter his characteristic grunt as he gives back his fleeting life to his Creator.

The next species of the genus *Caranx* that claims attention is the

GISHRAN. *Caranx nigrippinis.*

No illustration of this species figures in this paper, as from a photograph it would be extremely difficult to differentiate between a *Pirao* and a gishran. A description of this fish is therefore furnished.

DESCRIPTION—

Weight.—4¼ lbs.

Length.—1 ft. 8½ inches.

Head.—Resembles that of Pirao.

Eye.—Remarkably large, and of greater diameter than that of Pirao. Broad posterior adipose lid well defined, but anterior adipose lid absent.

Teeth.—Villiform on upper and lower jaws, and file-like on tongue and palate.

Body of considerable depth, and in contour similar to Pirao.

Fins. Anterior dorsal.—Consists of 5 spines connected by thin membrane.

Posterior dorsal and anal are rayed and are continued by a fringe to commencement of free portion of tail, last rays are thickened; 2 small spines just in front of the anal fin.

Pectoral.—Long and falciform.

Caudal.—Deeply-forked.

Colour.—Bluish to greenish on back, sides and belly white. Anterior dorsal deep black. Anal has a white margin. Upper anterior corner of

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posterior dorsal is tipped white and a broad blackish band runs across posterior dorsal fin and along posterior dorsal fringe; opercular spot moderately distinct. Lobes of caudal are tipped with black.

Lateral line runs back in a convex curve to a line dropped half-way along posterior dorsal fin, whence it continues in a straight line to tail. The free portion being prominently keeled as in the Pirao.

Remarks.—The presence of the opercular spot is not mentioned in Day's description of *Caranx nigrippinis*. The absence of the anterior adipose lid is also of interest, and the divergence of opinion as regards the question of villiform teeth on the palate and vomer calls for comment. The Gishran, similarly to the Pirao, when taken out of his natural element, utters a series of grunts like those made by young pig and these grunts may be continued at intervals until vitality ceases.

Let us now touch concisely on the habits and sporting qualities of the Gishran.

The Gishran is a very lively little bantam *Caranx*, and he frequently gulls the angler into the belief that he is a heavy Pirao. Like his elder brother he seizes the bait in a most impetuous fashion, so much so that the first rush of a 7 lb. Gishran will often take out 50 yards of line without a check. On a light rod the Gishran would afford first-class sport, and a right merry dance would be led the fisherman. The maximum weight to which the Gishran attains may be stated as 12 lbs., but a 7 lb. fish is fully mature; at this stage of his existence his flesh is so tough that it is quite unsuited for table purposes. The natural food of this species of *Caranx* is small fry of which preference is probably given to the mullet; it would be correct therefore to suppose that the Gishran would be found in shallow water. This surmise is entirely borne out by practical experience; the author cannot recall a single instance in which the Gishran has been caught beyond the five fathom line. In numbers the Gishran is not very plentiful, but what he lacks in density he makes up for in rapacity; he is a voracious little glutton and will consume with avidity a mullet measuring a third of his own length.

The next species that figures on the list of the surface-feeding *Caranx* is the

Shahbeni. *Caranx malabaricus.*

Of all God's finny creatures that have come under the personal observation of the writer not a single species can, for elegance and beauty, compare with the Shahbeni. Unfortunately this splendid game fish rarely comes to gaff; but when Dame Fortune is full of smiles, and a Shahbeni is flopping about at the bottom of the dinghy, the true angler, not the butcher, will surely be lost in profound admiration and ecstasy at the gorgeousness of his prize. The iridescence that shimmers over the shapely form is a marvel of delight; and the hues in which this denizen of the deep is garbed rival the reflections of an Eastern sunset.

Description—

Weight.—7½ lbs.

Length.—From tip of nose to fork of caudal 2 ft. 0½ inches.

Depth.—7 inches.

Girth.—16 inches.

Eye.—Large.

Teeth.—Villiform teeth on both jaws, tongue, palate, and gills.

Colour.—Back steely-blue to green, and brilliantly iridescent, belly silvery and equally nacreous. The sides both above and below the lateral line are marked with lemon yellow spots about the size of a pea; and some time after death the sides are covered with a most remarkable tracery. This gossamery filigree is extremely difficult to describe accurately. It resembles

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perhaps, as much as anything else, the tracings of gnarled and withered trunks and branches as depicted in the extreme background of a pen and ink etching. The anal and posterior dorsal fins proper and the fringes continuing towards the tail, and the caudal fin itself are tinged and tipped lemon yellow. There is a blackish blotch in each pectoral fin-pit.

Fins. Anterior dorsal.—Consists of 4 main spines connected by thin membrane, the anterior spine is divided at the base but each of these distinct initial spines unite into one composite spine at their extremities.

Posterior dorsal.—Firm and of moderate size; it is continued by a fringe to a point distant from the root of the tail equal to about $\frac{1}{12}$ of the whole length of body. This fringe terminates in a well-defined and comparatively longer ray.

Anal.—Situated well back, it is continued by a fringe identical with the posterior dorsal fringe. There are two inconsiderable spines situated anteriorly to anal fin.

Pectoral.—Looks extremely flimsy and of delicate construction; it is narrow and curves back gracefully and the span is most noticeable. The length of the pectoral fin of this specimen measured in a direct line from its base to its tip was nine inches.

Lateral line.—Starts from upper termination of gill opening, and gradually curves downwards to a point vertically above the posterior extremity of the anal fin proper, whence it travels in a straight line to the root of the tail. The posterior portion is devoid of shields; a keel of small dimensions starts laterally at a spot in line with the terminus of the posterior dorsal and anal fringes and continues to the caudal. The free part of the tail is thus compressed horizontally.

Anus—is situated anteriorly at the extremities of the pelvic fins.

Caudal.—Forked. The spread of the caudal fin of this $7\frac{1}{2}$ lbs. fish was $8\frac{1}{4}$ inches.

Scales.—Small.

Remarks.—The young are vertically banded and can be seen occasionally swimming about near the rocks at Jask. But the observer must approach cautiously. Day makes no mention of yellow spots on the sides of any species of *Caranx*, but on the Shahbeni this feature is at once distinguishable. Is it not possible that the bands on the young instead of entirely fading are gradually transformed into circular marks which remain in the adult as a permanent characteristic?

Let us consider tersely the habits, such as were observed, and the sporting nature of the Shahbeni.

It would appear that *Caranx malabaricus* is a cold weather visitant, and this species probably migrates to the open sea about May with the Pirao. It is inadvisable to draw too definite conclusions from experiences gained through the capture of three individual fish; but certain facts, if they point to the existence of a peculiar trait, are worthy of record. The three Shahbeni captured were all hooked within the six fathom line; from this circumstance and from independent observation it may be deduced that *Caranx malabaricus* prefers the shallows where he can feed the more readily on the mullet. The locals aver that the Shahbeni frequently goes about in pairs, and this assertion was confirmed on two separate occasions. A 19 lb. fish was lured to his fate in crystal clear water, and the author's diary gives the following account of the episode:—

"I could see it right away down and a pal was following it about all over the place; then a shoal of smaller fish came to have a look at the 'show'. I gaffed him successfully but had to get ——'s help to lift him into the boat —a good Shahbeni of 19 lbs. The second fish was swimming about for some time after his pal had been hauled out."

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On another afternoon the writer's second boatman presented him with a couple of Shahbeni of about 5 lbs. each in weight. He had a curious tale to unfold. As he was casting his net for bait for the evening's expedition he espied two Shahbeni disporting themselves in about 3 feet of water in close proximity to a half-submerged and battered dhow, a capture during the arms traffic operations. With the aid of a youth he got these fish so filled with panic that they dashed into the hull of the wreck, where they were promptly made captive! This villager was questioned at the time whether it was not an extraordinary coincidence that there were two Shahbeni in company, but he affirmed that such an occurrence was in no way abnormal. Of the fighting qualities of the Shahbeni there can be no two opinions; the maximum weight to which this species attains might be set down as 25 lbs. but a 10 lb. fish will put up a well-contested tussle. There is one further attribute to which this species can lay claim—its flesh is delicious; truly the Shahbeni ranks high on the list of the game fishes of the Persian Gulf.

The next species of *Caranx* to which reference will be made is the

DUBSI. *Caranx carangus* (?)

It is a matter for regret that no detailed description was taken of this fish when the author was at Jask, but during the last 18 months of residence there not a single individual of this species was hooked; a few notes were however jotted down in the fishing diary and these rough records are now given in default of a fuller and more reliable statement.

The Dubsi is very similar to a Pirao, but the following differences are noticeable:—

Head is not so convex and the eye is smaller.

Body hardly so deep.

General characteristics.—The body is covered with very fine scales, all fins are brightly marked with lemon-yellow except the anterior dorsal. Of the caudal the lower lobe is lemon yellow; the upper lobe is tinged lemon yellow at base but the tip is black. The maximum weight to which this species attains is about 10 lbs.

Remarks.—Like all the other surface-feeding members of the genus *Caranx* the Dubsi is a gamey little wight; the two individual fish whose capture was recorded were both taken close inshore in two to three fathoms of water. It is probable that if a smaller bait had been used this species would have figured more frequently in the table of catch; the objective of the writer, however, was always the Pirao, so the smaller species had, perforce, to take their chance. The flesh of the Dubsi, up to 5 lbs. in weight at any rate, is quite palatable.

We now come to the last species of surface-feeding *Caranx* in the form of the

PAPEEL. *Caranx gallus.*

Once again it must be admitted that the writer procrastinated, and beyond recording the distinguishing features of this fish no elaborate notes were taken. The following extract is culled from the angling diary:—

"His characteristics are long streamers to his posterior dorsal and anal fins; he is brilliantly iridescent and has a gold and blue sheen on him in certain lights."

With the Papeel it is a case of "once seen never forgotten," and the image of this fish as it is impressed on the writers' memory coincides exactly with the plate which Day gives in his *Fishes of India*. The single specimen that was creeled was taken on a mullet; evidence tends to shew

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that this species is rare at Jask, but the local fishermen gave it as their opinion that it attains a maximum weight of about 25 lbs.

The surface-feeders of the family *Carangidæ* are represented in the Persian Gulf by a second genus, *viz.*,

CHORINEMUS.

Day divides this genus into five individual species of which three abound in the waters round Jask. Of these three species one stands out prominently and bears the local name of

SARÁN. *Chorinemus lysan.*

DESCRIPTION—

Weight.—19¾ lbs.

Length.—3 ft. 7¼ inches.

Girth.—21¾ inches.

Spread of Tail.—11¼ inches.

Head.—The curve of the median longitudinal ridge is very much flatter than in that of the genus *Caranx*.

Body.—Is much compressed and the mouth though capacious is not very broad but the cleft is deep hence it is far more often than otherwise that the bait is seized sideways instead of tail-first.

Teeth.—Both upper and lower jaws are provided with villiform teeth; which also extend on to the vomer, palatines and tongue, and they are also present on the gullet both above and below.

Eye.—Large.

Fins.—*The anterior dorsal* is absent, but in its place are five short thick spines well spaced.

Posterior dorsal.—Anterior part is well elevated; it is continued towards the tail by a fringe of semi-detached finlets.

Anal.—Is the exact counterpart of the posterior dorsal.

Caudal.—Deeply forked.

Anus.—Is situated about half way between termination of pelvic and commencement of anal fins.

Colour.—The back is steely-blue to green, flanks and belly are silvery. On the sides are five steely blue to grey blotches about the size of a rupee spaced at regular intervals from gills along lateral line, which frequently intersects the first two marks. There is a black patch in the pectoral fin-pit. After death a change in colour appears quickly. The blotches on the sides become intensified, the sheen dulls down, and the belly and sometimes the gill plates become splashed with lemon yellow.

Skin.—The skin is thick and covered with small scales.

Remarks.—Day under the heading 'colours' makes the following observation:—

"Six to eight large, round grey spots like finger marks on the sides."

It is possible that the number of spots varies with individual fish, or it may be that the posterior ones fade when maturity is reached. The writer has heard the Sarán referred to as the "five-fingered Jack", and this appellation seems most appropriate.

Let us proceed to a short review of the habits of the Sarán and of his qualifications for inclusion in the category of game-fish.

Of all the surface feeders that populate the waters of Jask the Sarán is by far the most numerous. There is hardly a season of the year in which he is not seen, if not actually felt at the end of the split-cane; but from March to September his numbers would outvie those of a swarm of locusts. If the exile at Jask stands on the western shore of the promontory and watches the curl of the bottle-green wave, an instant or two before it takes the final plunge he will probably see a Sarán (or as many as five or six) flash into the centre of the

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breaker hard on the tail of its prey; and just as he imagines that pursuer and pursued will be rolled over and over in the rough and tumble of the surf, the vision is blotted out to reappear in similar fashion in the succeeding curler. At the very same moment, perchance, an angler, a full mile out sea-wards, may have his gaze rivetted on the translucent depths over which he is placidly floating. Following in the wake of the dinghy he will be breathlessly scanning a procession of "greenbacks"; the smaller and more inquisitive members are almost level with the rudder. Anon they dash past the oar, dive under the boat, and drop back into the *queue* behind; every motion is effortless and rhythmic. On the outer fringe of this drove the gleam of a silvery side denotes that the staider adults are on the *qui vive*. There is a sudden jerk on the rod, a quick strike, for the Sarán is a gentle nibbler as a general rule, and the reel shrieks out a pæan that is the sweetest of music to the ears of the angler. A hundred yards away, may be, a bow of molten silver shoots up skywards; it is a moment of tension, the tip of the rod is raised instinctively—ah—he is still held fast. Now he is beginning to tire; the gaze is unwittingly fixed on the spot where the line cuts the water; it is a matter of habit perhaps, but such is invariably the case until the quarry is viewed. Is that my fish, wonders the angler for a fraction of a second? Quick—reel in the slack or the prize will surely escape. At length the struggles grow feebler, and the leaps less frequent. There is the finny sprite circling slowly away down in the limpid depths. How his silvery side shimmers in the waning light of day; but of a truth he has summoned all his kith and kin from far and near. Large and small they dart hither and thither in evident excitement, unable to interpret the cause of the antics of their unfortunate mate. It is truly a fascinating sight. The gaff strikes home, and this game fish leaves his native element for the last time. The gathering still swims in agitation backwards and forwards in a vain search for its erstwhile comrade; gradually it melts away and the sea resumes its cold inanimation.

This leap of the Sarán is occasionally fraught with a spice of danger. During one outing just as the writer was on the point of gaffing his fish, it settled its own fate by jumping plump into the dinghy. The author was seated on the stern plank, and the Sarán fell between him and the tiller. To have a 3 inch forged steel hook driven into the back must be an exceedingly unpleasant sensation, but the resultant wound would be immeasurably aggravated if a 10 lb. Sarán were practising gymnastic feats on the tail triangle of the flight

The trait of inquisitiveness on the part of the Sarán is well illustrated by the following incident which occurred twice during the writer's fishing experiences at Jask. A Sarán was hooked, and shortly the strain was sensibly increased; presently two Sarán broke water together; it struck the author at the time that he had a pair of fish on his line, and such proved to be the case; both were successfully creeled. The explanation is simple. A Sarán seized the bait and got hooked; during its gyrations the morán, or a part of it, remained attached to the tail triangle which was looped to the eye of the tarpon hook by a piano-wire "length." The second Sarán evidently thought that this hated rival was chasing this spicy tit-bit, and so he incontinently swallowed it himself. Too late did he discover that he too had caught the proverbial tartar!

The staple diet of the Sarán is the morán, and during April and May when this curious fish comes in to spawn, the shallows round Jask, of an evening, are turned into a miniature maelstrom. At this season towards sunset, the western shore is lined with a score or more of local fishermen, each provided with a hand-line; some take up points of vantage on the rocks; a few enthusiasts wade waist-deep into the suri; others again

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anchor their dug-outs in the midst of the turmoil; they all bottom-fish with morán, and the collective evening's catch would probably total 40 or 50 fish.

Many a military castaway on this parched and desert sand-spit has been rescued from the depths of *ennui*, when the thermometer stands at well over 90° in the shade and the wet bulb is nigh on saturation, by the sporting proclivities of the Sarán; he can be crowned without prejudice as one of the gamest fishes of the Persian Gulf, attaining a maximum weight of about 35 lbs.; moreover his flesh would be welcomed on many a glittering board in Mayfair.

The remaining two species of genus *Chorinemus* that frequent the waters of Jask closely resemble the Sarán in make and shape; they are both distinguishable, however, from *Chorinemus lysan* by the size of the lateral spots which are much smaller and by the general build which is slighter. These two species will be discussed conjointly as even the expert will find considerable difficulty in differentiating between them without making a close scrutiny. Their local names are respectively—

SUSANSIR, *Chorinemus sancti-petri* and ZAYRPUR, *Chorinemus moadetta*.

The following are the most prominent characteristics of these two congeners:—

Head.—The head of the Zayrpur is slightly concave in appearance, whereas the median ridge of the Susansir is perceptibly convex.

Body.—The body of the Zayrpur is more compressed than that of the Susansir which is thicker laterally.

Colours.—The lateral spots on both species would seem to vary from three to six. In the Zayrpur there is a row below the lateral line whereas in the Susansir there are no blotches below the lateral line. Before death in the Zayrpur the pelvic fin is faintly tinged with yellow, which colour is absent in the Susansir. After death the sides and belly of the Zayrpur become splashed with yellow which extends from the caudal fin to extremity of lower jaw and also includes the gill plates; on the other hand the Susansir does not shew this feature in anything approaching the same degree if at all. The skin of the Zayrpur is much more leathery than that of the Sarán, and the flesh of either species is hardly so palatable as that of *Chorinemus lysan*.

Eye.—The eye of the Zayrpur is somewhat prominent, moreover in the latter fish there is a singular hollow situated posteriorly to the eye and superiorly to the gill plate. In the Zayrpur there is also a small adipose lid situated posteriorly.

Fins. Caudal.—In both species deeply forked. In the Zayrpur the anterior dorsal is represented by six disconnected spines. The posterior dorsal is tipped black and both lobes of the caudal are also black; there is one black spot on the anal, and the pectoral fins are black. Two short spines are situated anteriorly to the anal fin.

Remarks.—The description of the Susansir and the Zayrpur as set forth in this paper shows a marked divergence from that contained in Day's volumes. It will therefore be necessary to accept the author's identification with reserve. It is hoped that some trained naturalist may discover the means of confirming or discrediting the writer's diagnosis.

Both the Susansir and the Zayrpur are reputed to attain a maximum weight of about 6 lbs. Their staple diet is the mátoot (whitebait) and it is an exceedingly common spectacle at Jask to witness a drove of these fishes ravaging a shoal of mátoots, splashing about in pursuit of the terrified sprats. They are most prolific and when hooked put up an exceptionally strong fight for their size; of these two species of fish few specimens were recorded, the reason being that the dimensions of the bait trolled were usually too large to attract these diminutive game fish.

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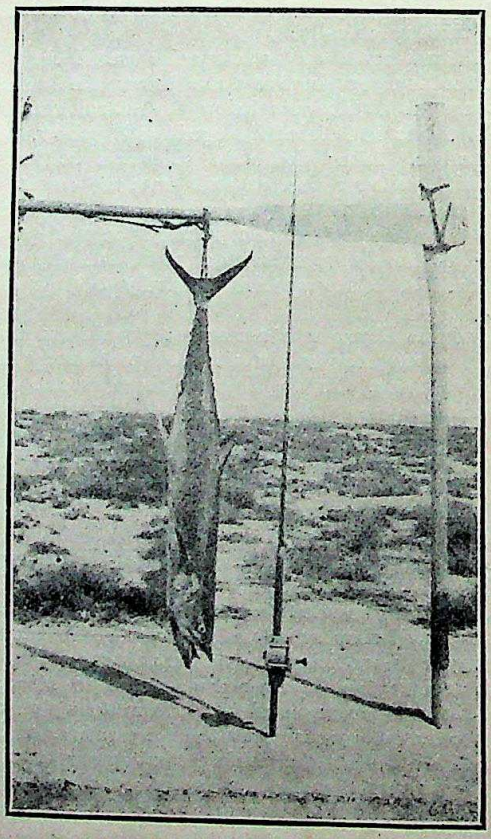
The next family of game fish of the Persian Gulf to which preference must be given is the

SCOMBRIDÆ.

Day divides this family into 5 genera of which we are concerned only with the genus *Cybium*. This genus is again sub-divided by Day into 5 individual species of which two species at Jask can be included in the band of surface-feeders. At the top of the branch of this genealogical tree is written in letters of gold

SURMAI. *Cybium commersonii.*

This nomenclature, perhaps, may convey no subtle meaning to the lay-mind even if he be a follower of the Gentle Art. For his enlightenment, therefore, let us christen this *Cybium* by his common or household designation. The Surmai is the far famed "Seer" fish, a name which figures so frequently on an up-country *menu*, and conjures up visions of muddy flabby flesh which is a positive insult to the reputation of the pelagic *Cybium commersonii*. The accompanying photograph depicts a 30 lb. Surmai, which succumbed to the author's wiles; it affords a good illustration of the comely proportions of this magnificent game-fish. A short description of the Surmai is appended for ready reference.



SURMAI OR SEER. *Cybium commersonii.* 30 lbs.

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DESCRIPTION.—

Weight.—30 lbs.

Length.—4 ft. 8¾ inches.

Girth.—18 inches.

Span of tail.—12 inches.

Teeth.—One row of flat lancet-like teeth in each jaw, the upper jaw closing *outside* the lower jaw. There are villiform teeth on the vomer, palatines and tongue. The extremities of the upper and lower jaws are co-terminate.

Fins.—Anterior dorsals.—Consists of 12 spines connected with transparent membrane; the spines are delicate.

Posterior dorsal—Commences about half way down the body.

Anal—Situated opposite the posterior dorsal.

Both the posterior dorsal and anal are continued towards the tail by a series of 10 separate finlets.

Pelvic.—Very small and fitting into a hollow in the chest.

Pectoral.—Is also small.

Caudal.—Spineless characteristically forked.

Lateral line is well defined, and if the finger be run across it, it will feel distinctly ridged throughout its entire length. Its course is irregular neither uniformly curved nor straight. At the free portion of the tail it develops into a soft keel.

Scales—Absent.

Anus—Situated just anteriorly to anal fin.

Colour.—The colour and marks are wholly typical of the mackerel; steely blue on the back with wavy lines on the back and sides, belly silvery. The whole of the body is most beautifully iridescent, and this feature is particularly noticeable while the fish is still in the water before being gaffed.

Remarks—Of all the game-fishes of the Persian Gulf for elegance and beauty the button must be accorded to the Surmai. His torpedo-like shape indicates a combination of power and speed, and this assumption is amply borne out in actual life. One of the most captivating spectacles is to witness at close quarters the leap of the Surmai. Surely he can be aptly styled the "cheetah of the ocean"? A school of mullet is basking on the surface unconscious of danger that is lurking below. A hungry gourmand is slowly slithering over the sandy sea-bed. Suddenly up shoots a gleaming flash. Up and up he soars into the airy heights with the hapless victim struggling cross-wise in his vice-like jaws, 8 feet, 10 feet, even 12 feet, a twitch of the mighty tail and down he glides with the grace of an expert diver.

As a rule when a Surmai takes a bait he never breaks water, nor has the writer ever witnessed a Surmai jump after being hooked. However the initial leap depends entirely on the distance of the lure beneath the surface. One incident will always remain indelibly fixed in the author's memory. He was out may be in 20 fathoms of water and had just felt a touch. While the dinghy was being gently paddled along the line was being reeled in to examine the bait. The mullet was within five yards of the boat, and was skating along the surface. The conditions for observation were perfect, a crystal-clear ocean, and a calm sea, and the author had his eye fixed intently on the spinner; for at such times often and often is some form of finny life espied shadowing the lure. The writer *saw* nothing except a momentary streak of silver until he realized that his bait was 10 feet in the air, and that he was gazing into the open jaws of a gargantuan Surmai, which appeared to be on the point of descending on to the tip of his nose. It is better to take 40 lbs. of lissome steel in the neck than full in the face especially when it is mixed up with three stout treble hooks, and is furnished with a mouth like a gin trap! A hunched-up back was hastily presented as a target to this ærial torpedo, but next instant

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there was a reassuring plop. Very luckily for the trio in the dinghy the Surmai had dived into his native element again in close proximity to the blade of stroke's oar; and what of the bait? It was recovered dangling despondently over the gunwhale!

In the waters of the Persian Gulf the Surmai probably attains a maximum weight of 60 lbs.; his first rush when hooked vies in pace with that of the Pirao, but after the initial dash for liberty is finished this fish soon begins to tire; it cannot be denied however, that from every point of view the Surmai is the embodiment of gameness.

A very brief notice will suffice for the second species of *Cybium* for the occasions on which this fish takes a trolled bait is rare as his weight does not exceed 4 lbs. The solitary specimen that was recorded attempted to swallow a mullet ⅓ of its own length in size. By the locals he is termed

GHOBART. *Cybium interruptum* or *Cybium guttatum.*

His characteristics are identical with those of the Surmai, except that in place of the mackerel markings the Ghobart has spots on his sides which are elongated horizontally. The identity of this species could be established by a reference to the number of teeth in the jaws. Day remarks that *Cybium interruptum* has teeth comparatively small, equal sized, conical, and somewhat compressed, about 28 or 30 in the upper, and 24 rather larger ones in the lower jaw, whereas the teeth of *guttatum* are lancet-shaped, laterally compressed, and somewhat wide apart about 10 to 12 in either jaws and frequently some smaller ones likewise present for taking the place of any lost. Day also states that *guttatum* grows to a length of 6 feet, which would rather eliminate the possibility of its being the Jask Ghobart. It is to be hoped that this point may be elucidated.

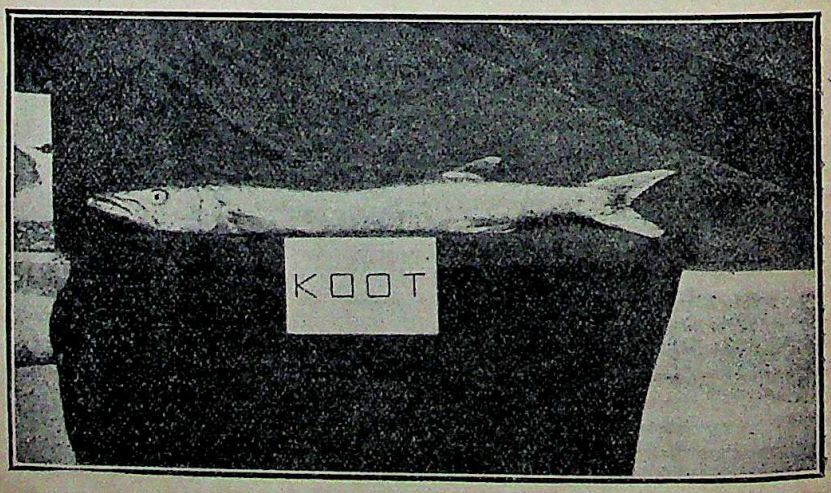
Let us now pass on to the review of a family of fishes whose members are renowned throughout the tropical seas of the world for cunning and voracity, *viz*:—

SPHYRÆNIDÆ.

Of this family only one genus *Sphyræna* figures in Indian waters. Day divides this genus into 4 individual species, the Jask representative being the

KOOT. *Sphyræna obtusata.*

In other words one of the notorious Barracuda tribe.



KOOT. *Sphyræna obtusata.* 20 lbs.

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With the Kŏŏt (pronounced as in "foot") it is a case of "once seen never forgotten" and the accompanying photograph of a 20 lb. one will fully bear out the contention. Appended is a description of this sea Caliban :—

Description.

Weight.—20 lbs.

Length.—4 ft. 7 inches.

Girth.—15 inches.

Body—Elongated and nearly cylindrical.

Head.—Lean and long and flattened horizontally and the extremity of the lower jaw terminates in a ram. When the mouth is closed the head bears very much the appearance of an exaggerated pencil point, though somewhat squared off towards the base of the point. The lower jaw protrudes to form the ram already mentioned.

Teeth.—The dentition is remarkable and most formidable. Situated in the centre of the extremity of the lower jaw and at the base of the ram is a single sharp elliptical tooth. At first sight this tooth would appear to be conical, but when viewed from the front of the mouth it will be observed to be more elliptical than conical. This tooth fits into a socket in the upper jaw. The extremity of the upper jaw is furnished with a pair of sharp elliptical teeth similar to the single fang at the point of the lower jaw. These two teeth fit into sockets in the lower jaw, one on either side of the single fang. Situated just posteriorly to this pair of teeth are a second pair similar to the anterior pair. Both the upper and lower jaws are lined with a row of extremely sharp, lancet-like, flattened teeth of very redoubtable appearance; the teeth of the upper jaw closing *inside* those of the lower jaw (exactly the opposite to the Surmai). The tongue is furnished with villiform teeth which are absent on the palate.

Eye—Large and prominent.

Colour.—The back and head are of a dark greyish green colour, which turns to white on the belly; iridescence is practically absent. The grey-green of the back is continued down the flanks in ill-defined streaks. The caudal is tinged with yellow, and this yellow colouring is noticeable to a certain extent on the posterior dorsal fin.

Fins.—*Anterior dorsal* has 5 spines which are connected by a transparent membrane. The *posterior dorsal* and *anal* are situated well back on the body, the anus being immediately in front of the anal fin.

Caudal.—Forked and rayed.

It is a notorious fact that the trait of "slimness" is developed to an extraordinary degree in the Barracudas, and *Sphyræna obtusata* worthily upholds the family tradition. The Kŏŏt probably grows to 50 lbs. in weight, but these hoary veterans are far too wary to be deceived by any of man's puny lures; the craftiness with which he takes the bait is a marvel; methodically he follows it, gently mouthing it at intervals. The angler feels only a very slight tug on the line and he must needs strike hard and swiftly; even so the manner in which the Kŏŏt successfully avoids the hooks is astonishing, and at times exceedingly exasperating. Frequently this barely discernible nip will have divided a fair sized mullet into two or even three pieces, as clearly as if the operation had been performed with the aid of a kitchen knife. The sport afforded by a Kŏŏt of ordinary size is short-lived, though this failing is somewhat counterbalanced by the palatableness of his flesh. The smaller one comes in like a log; he then stands on his tail, opens his jaws and shakes his head viciously. On one occasion a Kŏŏt of medium weight performed these evolutions in commendable style, but added an extra turn to the pantomime by violently ejecting a score or so of half-digested "mátoots." The inordinate stench that was diffused from its œsophagus can best be likened to the affluvium emanating from a burst drain

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The patriarch, when hooked, creates a tremendous commotion on the surface of the water. Off he starts at full speed skimming along half in and half out of his element, jaws wide-spread and ugly head beating the air impotently, the incarnation of baffled rage and savage fury. There is always a certain indescribable satisfaction in feeling the gaff slip into his shoulder, for the Kōōt might aptly be termed "the Hun of the Seas".

There is yet another family of true surface-feeders that is encountered at Jask; reference is made to the

POLYNEMIDÆ

of which only one genus *Polynemus* is found in Indian waters. Day divides this genus into 8 individual species; and of these there is but one representative namely the

Rajgoo. *Polynemus tetradactylus.*

in fact the Bamin of estuary anglers.

As this fish has been previously described in the leading angling books on India, a further description will be redundant.

The Rajgoo would appear to be a rare visitant to or a thinly scattered resident of Jask waters, and those that came to creel were captured in 1 to 3 fathoms. The sporting tendencies of the Bamin are well-known throughout India, more so in tidal estuaries than in the open sea; but is it possible that his praises have been sung rather too loudly by enthusiasts whose experience of the gameness of the true pelagic fishes is meagre if not entirely wanting? Is not, the Bamin's reputation, perhaps, founded on report rather than on hard fact? The author is fully aware that such sentiments will in some quarters be regarded as rank heresy, and that he is laying himself open to a storm of opprobrium. When all is said and done, however, the Rajgoo is but a mere fish, and is by no means immortal. It cannot be denied that he is a fine sporting fish, and that his first rush for liberty and his subsequent leaps for freedom are exhilarating, but that is no reason why he should be defied. The author's personal impression is that there are many other species that are his equal, and several his superior in gameness. His maximum weight at Jask would be about 25 lbs., but according to Day, 350 lbs. cannot be considered as an extravagant estimate. The writer is quite open to conviction; and if the goddess of Fortune ever favours him with a three figure Bamin at the end of his line, he is quite prepared to exalt the virtues of *Polynemus tetradactylus* to the very dome of Heaven.

Let us now pass on to an examination of one of the most multitudinous families of fishes that inhabit the waters of our globe—the

PERCIDÆ.

It is a moot-point whether the *Percidæ* can be included strictly in the term "surface-feeders," but for the benefit of those species that have proved themselves willing to take a trolled bait, the family in general can be given the benefit of the doubt. Day divides the Indian *Percidæ* into 29 genera, of which the genus

Serranus

first claims our attention. The genus *Serranus* is again sub-divided by Day into 30 individual species; of these the main representative at Jask is the

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HAMÚR. *Serranus stoliczkæ.*

Before entering into a detailed description of this species and others of the same genus a word of warning will be uttered as a guide to further investigation. Day remarks:—

"The colour of these fishes, which varies so extensively in the same species, can hardly be accepted as a trustworthy guide for grouping. * * * The numbers of rows of scales is very important amongst these fishes, as so ably pointed out by Bleeker, and many a mistake in identification would have been saved, had his plan been adopted, which is to give the numbers of transverse rows going to the lateral-line from both above and below."

It must be admitted, reluctantly perhaps, that the advice contained in the latter portion of the above extract was not adhered to by the author for the simple reason that in many instances the aid of a magnifying glass would have had to be requisitioned and no such instrument was forthcoming at Jask. In consequence the identification of the various species must be accepted with reserve.

Description.

Weight.—19¾ lbs.

Length.—2 ft. 10¼ inches.

Girth.—21¼ inches.

Head.—Is large for size of fish and broad.

Eye.—Is small and leery in appearance, iris golden, pupil oval.

Teeth.—Canines in both jaws, a broad band of villiform teeth on upper jaw tapering to both extremities at angle of mouth. There is also a similar formation on lower jaw, but the band is not so broad. Two rows of villiform teeth are present on the palate in the form of a broad inverted V, the base of the V being on the vomer. These teeth protrude at an angle thus:— The edges of the gills are studded with groups consisting of 2 or 3 teeth in each group; patches of sharp villiform teeth encrusts the top and bottom of the gullet.

Mouth.—Exceedingly large, tongue diminutive.

Fins.—*Dorsal* 10 well-defined spines connected by a thin membrane which bears marks much resembling basaltic sections in appearance; the dorsal fin is continued to the tail by a rayed fringe of considerable dimensions.

Pectoral.—Spineless and speckled.

Pelvic.—One strong spine on outer edge, colour mottled.

Anal has one large and one small spine situated anteriorly, remainder is rayed; it bears the basaltic marks.

Caudal of large proportions and slightly rounded.

Colour.—The general colour is chocolate, with white basaltic marks all over head, gill-plates, back, sides and some of the fins. Towards the belly these basaltic marks get less defined, and the chocolate background changes into large clearly marked spots. The marks and spots are continued to the upper and lower jaws respectively. The throat is tinged delicate pink. The back ground of tail, dorsal fringe, and anal fin is much darker, almost black and the marks are milky-white.

Scales.—The body is covered with small scales.

Lateral line is ill-defined.

It will be of very considerable interest to compare the above description with that furnished by Day as far as colours are concerned; for this purpose Day is quoted in full:—

"*Colours.*—Light-brownish red, becoming hyacinth-red on the sides and below, barred with four vertical darker bands, the anterior proceeding from

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the whole base of the spinous dorsal, these bands become indistinct in large specimens. Head and body, as far as the base of the soft dorsal, and anal spotted with reddish-orange or gall-stone yellow, which, on the head, and sometimes as far as the base of the pectoral fin, are in hexagonal blotches, divided by light lines. Base of pectoral white having a black crescentic band. Under surface of the throat and chest with large black marks sometimes enclosing lighter spaces. Dorsal fin with chestnut-brown spots; some white ones on the caudal, and anal."

Can two more divergent statements possibly be imagined? The explanation is that Day's description is taken from a live specimen.

Day further mentions that *Serranus stoliczkæ* attains at least 12 inches in length. If the Hamúr and *Serranus stoliczkæ* are identical then this estimate by Day must be erroneous. To what weight then does the Hamúr grow? The writer credits the Hamúr with a maximum weight of 60 lbs., but it is extremely doubtful whether a monster of this size would ever be recorded on rod and line. This prognostication is made from the results of a study of the habits of this species; which have come under the personal observation of the author. Among the lads of Jask village there is usually a big slice of time available for "leisure," and these hours of idleness are frequently passed on the rocks facing west bay. Suddenly "larking" ceases, and an enquiry will elicit the information that a Hamúr has been spied making into a certain hole in a submerged ledge. To woo him to destruction is no difficult matter; all that is necessary is to dangle a small fish at the exit to his lair. Patience is very soon rewarded for his greedy ruffian will assuredly dart out and seize the lure. It is then a case of "pull devil pull baker" for the devil is trying his devilmost to get back into his den. The baker, however, generally comes out of the contest triumphant, and a few seconds later the devil is being swung round on a yard of line like a Catherine's wheel, and being mercilessly bashed on the rocks, till he is reduced to an inanimate pulp. So it is with the angler when trolling; if a Hamúr happens to get hooked be invariably makes straight for the nearest hole in the rocks suitable to his size, probably descending three tortuous alleys to reach his cell. When such an incident occurs two alternatives are open to the fisherman. He can either anchor his craft and sit over the Hamúr till the latter leaves his retreat; or he can attempt to haul him out by brute force. With the author the second procedure was always adopted, and more often than otherwise Hamúr, spinner, trace, and some yards of line departed. As regards food the Hamúr is omnivorous, though this trait does not affect adversely his edibility. On one occasion a specimen about a pound in weight was brought to the writer; and an observant eye noticed that his belly was suspiciously pendulous. It did not require much time to make an incision and an entire rock crab was excavated complete with all claws including the nippers!

Can such a cavernous-mouthed Apicius be dignified with the appellation of game-fish?

A brother of the Hamúr is also taken in the rocky shallows round Jask; his local name is

LEDDUM. *Serranus areolatus.*

and the following is his description, which was taken from a small fish of 2 lbs. 10 oz.

Head.—Of medium size, the median longitudinal line runs rakishly backward at an acute angle.

Mouth.—Capacious with lips on upper and lower jaws.

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Teeth.—4 conical teeth in extremity of lower jaw and also canines in the upper jaw; on each side of the lower jaw there are two rows of villiform teeth, spreading into several rows towards the extremity. In the upper jaw there is one row of similar teeth spreading into two clusters on the palatines; there is also a cluster of villiform teeth on the vomer. There are no teeth on the tongue which is exceedingly well developed. There are villiform teeth on the upper and lower surfaces of the gullet which spread to the edge of the gills.

Gill plates, are characteristic; the edges curve back and form an acute angle posteriorly.

Eye.—Small for size of fish, iris yellowish.

Fins dorsal.—Double, *i.e.*, one continuous fin but divided into 2 parts; the anterior portion consists of 1 short strong spine followed by 10 longer spines which are stout, very sharp and connected by membrane. The posterior portion is rayed.

Caudal is rayed, long, broad and practically straight cut, though perhaps slightly forked.

Anal situated immediately below posterior portion of dorsal fin, rayed but with three sharp spines anteriorly; the first of these spines is short and stout, the second is longer and very stout, and the third is still longer but less stout.

Pectoral is situated immediately above pelvic and former is slightly tinged with yellow; both are rayed but the latter has one hard spine situated exteriorly.

Colour.—General back-ground milky-white closely covered with chocolate marks; on back, dorsal, caudal and flanks these are basaltic in character, merging into distinct chocolate spots along gill plates, throat, and sides of belly, also pectoral, pelvic and anal fins; actual belly is white.

Scales.—Small.

Lateral line is indistinct.

Remarks.—Day states that in Madras and Andaman specimens, the markings on the fins are not always so distinct, whilst there is generally a white upper half to the last third of the caudal fin. On specimens examined at Jask, however, the markings on the fins were quite distinct; the white upper half to last third of caudal is absent; the pectoral is well-marked and has a reddish margin; the pelvic is distinctly whitish bluish in hue and well marked.

From information collected locally the maximum weight of this fish would seem to be about 30 lbs., so that he is a smaller species than the Hamúr; his flesh though somewhat soft is quite palatable. As regards the habits of the Leddum, he possesses the same generic failing as the Hamúr, in that he bolts for the nearest hole in the rocks when hooked. The largest specimen that was creeled by the writer weighed 11¾ lbs. It had followed the usual custom and anchored itself hard and fast, and instructions had actually been given to the boatman to break the line; however the line held and the Leddum was successfully uncorked.

Let us now investigate another genus of the perch family, namely, *Lutjanus*. Day divides this genus into 28 individual species of which 1 species can perhaps lay claim to be styled a surface-feeder. This fish is known locally as

SURKHOO. *Lutjanus argentimaculatus.*

The accompanying photograph gives a good idea of the conformation of this species; the actual weight of the specimen figured being 8½ lbs. It may be remarked that some species of genus *Lutjanus* are so similar that a detailed account of the Surkhoo will not be out of place.

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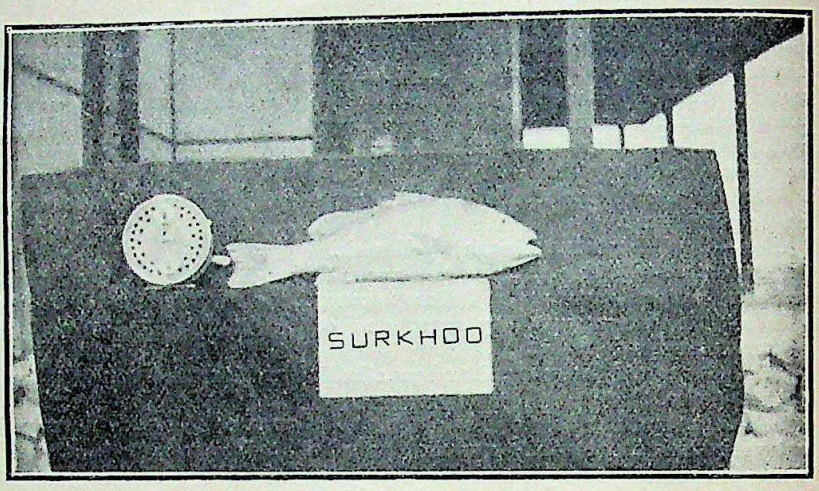

SURKHOO. *Lutjanus argentimaculatus.* 8½ lbs.

Description.

Weight.—8½ lbs.

Length.—2 ft. 1¼ inches.

Girth.—17¼ inches.

Eye.—Large, iris being blood-red.

Teeth.—Each jaw is furnished with a few sharp canine teeth; villiform teeth on palate which extend almost to gullet; absent on the tongue; villiform teeth on upper and lower surfaces of gullet and on the edges of the gills.

Gill-plate.—Edges curve back, and form a prominent angle posteriorly.

Fins.—*Dorsal* is divided into two portions, but these are not separate; anterior portion consists of 9 rays connected by transparent membrane, posterior portion is rayed.

Caudal.—Is long and broad, and slightly forked.

Anal.—With the usual 3 sharp spines.

Pelvic.—Situated a little posteriorly to pectoral with an exterior spine.

Pectoral.—Of moderate length, narrow and fine.

Colour.—Head almost plum coloured, gill plates body and tail tinged delicate pink; dorsal, caudal, and anal fins edged brick-red.

Scales.—Of medium size.

Lateral line.—Not well defined.

Remarks.—Day states that this species attains upwards of 2 feet in length and is good eating. It would appear however that this estimate is too meagre, and the author would place the maximum growth at about 15 lbs., which would approximately give a length of 3 feet. The third anal spine is considerably longer than the second one. When caught, the Surkhoo has a distinct dark golden elliptical mark larger than a rupee covering the lateral line below the soft dorsal. The Surkhoo is a a beautiful fish and when hooked affords good sport; it is a matter for regret that it does not come to gaff more frequently on a trolled bait.

Two other species of surface-feeding game fish are included in the list of fish creeled, *viz.*, the

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GIDDIE and SEEA.

The identity of these species was never solved, though as bottom-feeders both are common, more especially the Giddie; this fish as a general colouring has blue spots on a chocolate back-ground, whereas the Seea is reddish; from their appearance they would seem to belong to the family of *Percidae*, but such a statement is mere conjecture, and requires verification.

There now remain only two species of surface-feeders about which the writer can speak from personal experience; reference is made to the family of

SHARKS.

No one can possibly deny that a shark is a fish, but can a Shark honestly be termed a *game* fish? Shark fishing calls up visions of a hook like an anchor, chain to match fastened to a three inch hawser, with a chunk of mouldy pork as a bait. But such is not *fishing*. Where art and skill cease to count, there *angling* also comes to a dead stop. There can be no gainsaying the assertion, however, that given suitable tackle a shark will put up a terrific fight, which is not unaccompanied by a spice of danger. Sharks, therefore, can without prejudice be placed in a separate class; they are *sporting* fish, if legitimate methods be employed for their capture, although they are not strictly speaking *game* fish.

The family CARCHARIIDÆ.

is divided by Day into 6 genera; of these the surface-feeders at Jask are included in the genus

CARCHARIAS.

This genus is again sub-dividend by Day into 17 individual species of which two species are encountered at Jask under the general name of

COOLIE.

The first species is

Carcharias tricuspidatus.

The following are the measurements of a specimen which the writer killed after a fair and square combat of titanic intensity lasting $4\frac{3}{4}$ hours on tackle which was regularly employed during the ordinary course of a day's fishing.

Weight.—188 lbs.

Length.—7 ft. 7 inches.

The capture of this Shark probably constitutes a record for rod and line in India. This monster was taken trolling on a moran and was hooked within 200 yards of Jask Point. That larger individuals terrorize the finny life round this promontory goes without saying but it is open to question whether they will attack man without provocation. They are essentially piscivorous by nature, and it is the writer's firm opinion that this Shark unless wounded or provoked will not assail the genus *Homo*. Cases have been treated at the Jask dispensary of locals suffering from ghastly wounds; but inquiry has invariably elicited the information that such injuries were inflicted during the process of disentangling a Shark from a net or extracting a hook from its jaws.

The second species is

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Carcharias melanopterus,

and he is at once distinguished from *tricuspidatus* by having the extremities of all the fins coloured black. A specimen which was captured on the customary tackle measured as under:—

Length.—5 ft. 6 inches.

Weight.—88 lbs.

Girth.—33½ inches.

and the great feature of the fight was the manner in which it continually hurled itself into the air, and it may be taken for granted that the homely adage "distance lends enchantment" was *not* ignored!

A point of considerable interest, in connection with this particular specimen is that when it was cut open, six perfectly formed embryos were found *in situ*. The following measurements were most carefully recorded:—

Weight of embryos—10 oz., 10 oz., 11 oz., 11½ oz., 11¾ oz., 11¾ oz.

Length.—16 inches to 16¼ inches.

As regards the size to which these two species grow, Day furnishes some illuminating data. We read that:—

"*tricuspidatus* attains at least 20 feet in length—one on board a native craft measuring that length!"

and that—

"The liver of one (*melanopterus*) at the Government Fish-oil Factory at Calicut weighed 270 lbs.!"

No wonder the Shark has a reputation for venom and animosity!

There is still one feature that has escaped comment. This group of Sharks possesses a distinctive mark in the form of a natural pit at the base of the caudal fin.

In reality this so called pit bears much more resemblance to a "snick" or "notch" than it does to a "cavity." The imaginative mind can conjure up the scene where the Potter horrified and enraged at the malicious Gorgon that he has shaped is in the act of severing its tail, and so ensuring its destruction, when he in turn is by some unseen Power suddenly turned into stone. Does this notch at the base of the caudal fulfil any useful function, or is it merely one more of Nature's incomprehensible freaks?

Lucky indeed will be the angler who can claim that he has caught every species of game-fish that it is possible to capture in any given locality. In the case of the writer there are some species that never felt the prick of his heavy sea-gaff, and these varieties will now be tabulated.

HOUR. (Species undetermined.)

The Hour (the "ou" being pronounced as "our") is wholly and entirely a deep-sea fish very rarely approaching within the 15 fathom limit. In contour it bears a marked similitude to the tuna, though of a diminutive type probably not exceeding 30 lbs. in maximum weight; the Hour would therefore seem to be one of the three species of genus *Thynnus* mentioned by Day. In east bay of Jask from October to March the Hour can be seen in shoals splashing about on the surface, and making graceful slanting leaps in all directions. Many an afternoon did the writer devote to the downfall of the Hour; but never a single individual fish was circumvented. It is evident therefore that neither mullet nor a moran constitute his natural diet; for such lures were spurned with positive contempt. The Hour is essentially a surface-feeder, and it may be that some description of Tuna plane or kite, if employed, would being about his discomfiture, for he probably has a relish for the flying-fish. In any event a field lies open in this direction for the angler gifted with an inventive turn of mind. At certain seasons of the year a veritable fleet of fishing dhows arrives at Jask from up the coast

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to hunt the Hour. They are taken in drift nets at night, and salted for home consumption, and for export to the Arab littoral.

KHARKOOR. *Belone annulata* or *charum* or *melanostigma*.

This fish is the commonly-known garfish, and is distinguished from the remaining three species mentioned by Day by its forked caudal. It is a very attenuated fish with a pair of beaked jaws furnished with sharp pointed teeth. It is caught in large numbers by the locals in their white-bait drag nets, and is excellent eating, a peculiarity being its green back-bone. Owing to its narrow mouth it is probably incapable of tackling the ordinary sized mullet or moran which are used for trolling for the other species of Jask surface-feeders. Even so on Tarpon tackle it would furnish no sport although it might attain 7 to 8 lbs. in weight.

DAHI. (Species undetermined.)

The Dahi is a bright silvery fish with an exceedingly compressed body and large eye. It is included in the list of surface-feeding game fishes as it occasionally takes a trolled bait, but such an incident is of rare occurrence. Its capacity for leaping is most remarkable. Up it will shoot at an angle of 45° to a height of 8 or 10 feet as rigid as if it were a piece of bar-silver out for an aerial reconnaissance. Frequently it will sail over the boat and its globular eye gives the impression that it has just missed a tragic fate by a scale's breadth! The Dahi attains a maximum weight of about 6 lbs., but its flesh is quite unfit for table purposes owing to its bony anatomy.

SUKHULLA. (Species undetermined.)

It is impossible to speak with any authority on the subject of the identity or habits of this fish except that he would appear to be an open-sea variety and may belong to genus *Echeneis*. During nearly two years angling at Jask only one individual fish of this species was hooked sufficiently for the boatmen to recognise his tribe, and to the great disappointment of the writer this one and solitary Sukhulla succeeded in breaking the piano wire of the flight and so escaped an impending fate, in about 15 to 20 fathoms of water. That he fought valiantly for his size (about 10 lbs.) is unquestionable, but at the same time a further and closer acquaintance is desirable before he can be admitted as an honourable member of the illustrious community of game-fishes.

BOMBIL.

The etymology of the local names of fishes frequently opens up a wide vista of speculation. Thus the "Pirao" of the Persian Gulf is the "Parah" of Madras and the Andamans; but who acted as god-father to the "Pirao?" So it is with the Bombil, but in his case conjecture is less nebulous. Here is the Bombils genealogical tree.

Family = SCOPELIDÆ.
Genus = HARPODON.
Species = *Harpodon nehereus*.

In plain language Bombil is the far-famed "Bombay Duck"! The question will at once be asked:—

"Do you seriously intend to include the Bombil in the charmed circle of game-fishes?"

Let the reader decide for himself. One Bombil weighing 7½ oz. *was* caught trolling on a mullet almost as long as the Bombil itself. A Bombil

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of 7½ oz. on the end of a Tuna rod does not afford the acme of sport and this particular fish was not gaffed! The edible qualities of the Bombay Duck are notorious.

Let us now complete our investigation of the habits and identity of the surface-feeders by an examination of the characteristics of the last species on the list. This fish is known locally as the

TULLOO. (Species undetermined.)

Can a fish that has never been caught trolling during nearly two years of continuous angling, be conscientiously termed a surface-feeder? It must be acknowledged that such an admission requires a considerable stretch of the imagination; yet the locals assert that the Tulloo *ought* to be taken in this fashion. That he is a sand-grubber is undeniable, and that he can be captured by means of bottom-fishing is beyond dispute. The writer himself was actually present when a Tulloo was creeled by that method. During the author's residence at Jask it was his most ardent desire to hook a Tulloo, but the Goddess of Fortune proved woefully fickle, and never a single specimen was recorded. This ambition was inspired by the glowing accounts of the Tulloo's fighting powers, as narrated by the writer's head boatman—a series of frenzied leaps in which the fish even hurls itself backwards and forwards over the boat! Does this acrobatic display furnish a clue to the identity of this knight in scaly armour. Can he be the Silver King of the Indian Seas? The locals affirm that he attains a maximum weight of 100 lbs.; a Tarpon ranging up to three figures—what a phantasy of dreams such a possibility must awake in the breast of every disciple of Izaak Walton! Yet some day these utopian flights of fancy may dissolve into a glorious reality. *If* the Tulloo *does* prove to be the Silver King of the East, then the fame of Jask as an angling Elysium is established for all ages.

(*To be continued.*)

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BOMBAY NATURAL HISTORY SOCIETY'S MAMMAL SURVEY OF INDIA, BURMA AND CEYLON.

Report No. 24. Sind.

By R. C. Wroughton.

Collection	... ...	No. 24.
Locality	... ...	Sind.
Date	... ...	February to May, 1915.
Collected by	... ...	Mr. S. H. Prater, Museum Assistant, Bombay Natural History Society.

Earlier Reports ... ... No. 1, East Khandesh, Vol. XXII, p. 392, 1912; No. 2, Berars, Vol. XXI, p. 820, 1912; No. 3, Cutch, Vol. XXI, p. 826, 1912; No. 4, Nimar, Vol. XXI, p. 944, 1912; No. 5, Dharwar, Vol. XXI, p. 1170, 1912; No. 6, Kanara, Vol. XXII, p. 29, 1913; No. 7, Central Provinces, Vol. XXII, p. 25, 1913; No. 8, Bellary, Vol. XXII, p. 58, 1913; No. 9, Mysore, Vol. XXII, p. 283, 1913; No. 10, Kathiawar, Vol. XXII, p. 464, 1913; No. 11, Coorg, Vol. XXII, p. 486, 1913; No. 12, Palanpur, Vol. XXII, p. 684, 1913; No. 13, South Ceylon, Vol. XXII, p. 700, 1913; No. 14, Shan States, Vol. XXII, p. 710, 1913; No. 15, Kumaon, Vol. XXIII, p. 282, 1914; No. 16, Dry Zone, Central Burma and Mt. Popa, Vol. XXIII, p. 460, 1915; No. 17, Tennasserim, Vol. XXIII, p. 695, 1915; No. 18, Ceylon, Vol. XXIV, p. 79, 1915; No. 19, Bengal, Vol. XXIV, p. 96, 1915; No. 20, Chindwin, Vol. XXIV, p. 291, 1916; No. 21, Gwalior, Vol. XXIV, p. 309, 1916; No. 22, Koyna Valley, Vol. XXIV, p. 311, 1916; No. 23, Sikkim, Vol. XXIV, p. 468, 1916.

This Collection "made by Mr. Prater in Sind" is mostly from the Upper Sind Frontier. The Gazeteer gives the climate of the Upper Sind Frontier as remarkable for its great maximum heat, which is the greatest in India, the extreme variability of the temperature, in the hot weather from April to October, the thermometer reaching as high as 120, and the low rainfall, averaging 3 inches annually.

The Province of Sind consists of the lower valley and delta of the River Indus lying between Lat. 23° and 28°49′ N. and Long. 66°50′ and 70°E. Its area including the Khairpur State is 54,123 square miles. It is bounded on the west by Baluchistan, on the north by Baluchistan, the Punjab and Bhawalpur State, on the east by Rajputana, and on the south by the Rann of Cutch and the Arabian Sea. The Collection represents the Mammal Fauna of a very small portion of this territory. It includes the Upper Sind Frontier District, where collecting was restricted to the level country; the mountainous area of the Baluchistan border was not visited; the Sukkur District,

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here the work was confined to alluvial land flanking the west bank of the Indus, the desert portions on the east bank remaining untouched, one camp at Gambat in the Khairpur State and one at Naundero in the Larkhana District. This, including a few days spent at Karachi, represents the total area worked over in Sind.

The following are the notes on, and descriptions of, actual collecting stations visited.

JACOBABAD.—On the Upper Sind Frontier. The ground collected over is some three miles from the town, and is covered over with a dense growth of Tamarisk and Babul (*Acacia arabica*) interspersed with great tussocks of "Kanh" grass. It might be mentioned that Jacobabad is the hottest and coldest registering station in the Meterological Department of the Bombay Presidency.

KASHMOR.—On the Upper Sind Frontier, 70 miles east of Jacobabad. The Indus is 5 miles from the town. Extensive cultivation on both the sides of the Desert Canal which runs past. Collecting was done chiefly on the Canal banks or in its vicinity.

SUKKUR.—On the Indus. The town is built on low barren limestone hills, the banks of the river below it are covered with dense date groves. A short stay was made in Sukkur town, but the major portion of the collection was obtained from villages flanking the west bank of the river, commencing at Chak some 20 miles north of Sukkur and working upwards to Shikarpur. Ground collected over was for the most part highly cultivated with occasional forests of Babul and Kandi (*Prosopis spicigera*). The collections were made near the river on land within the immediate influence of its inundations.

GAMBAT.—In the Khairpur State which lies on the east bank of the Indus. Dense forest country, a great part of which is fenced off into game preserves, known in Sind as "shikargarhs." A small collection was made at Kot Diji, situated a few miles from Khairpur city at the foot of a range of hills which run southward from Rorhi. These hills are barren and forbidding, composed chiefly of nummulitic limestone.

NAUNDERO.—In the Larkhana District, 12 miles north of Larkana. Cultivation interspersed with semi-desert salt lands.

LHANDI.—Some 20 miles out of Karachi. Highly cultivated country. I made a very short stay here and had not much opportunity for collecting.

Mr. Prater wishes to record his obligations to the following gentlemen for their kind assistance and support. To Mr. J. R. Martin, I.C.S., Deputy Commissioner, Jacobabad; Mr. D. Healy, D.S.P., Jacobabad; Mr. W. T. Kirkpatrick, D.S.P., Sukkur, through whose assistance a great part of the collection in the Sukkur District was obtained; Mr. C. S. Campbell, I.C.S., Collector, Sukkur; H. H. The Mir of Khairpur, and Mr. G. A. Shillidy, D.S.P., Larkana.

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The Collection contains little of special interest. *Pipistrellus kuhli* appears, identical with the European form as well as in a pale local form. *Scoteinus pallidus*, which I believe has not again been taken since Dobson named it from Mian Mir, and of which the type is in the Indian Museum is of course most welcome. But beyond these all the other forms have been received from Cutch and northwards.

(1) HIPPOSIDEROS FULVUS, Gray.

The Bicoloured Leaf-nosed Bat.

(Synonymy in No. 3.)

♂ 10, ♀ 15, in al. 24, Sukkur.

(*See* also Reports Nos. 5, 6, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, 22 and 23.)

(2) PIPISTRELLUS KUHLII, Natt.

The White-bordered Bat.

1817. *Pipistrellus kuhlii*, Natterer. Deutsche Fledermi, p. 55.
1891. *Vesperugo kuhli*, Blanford. Mammalia, No. 189.
♂ 1, ♀ 14, in al. 16, Gambat.

(3) PIPISTRELLUS KUHLII LEPIDUS, Bl.

The Pale White-bordered Bat.

1845. *Pipistrellus lepidus*, Blyth, J. A. S. B., XIV, p. 340.
1863. *Nycticejus canus*, Blyth, Cat. p. 32.
1867. *Scotophilus lobatus*, Jerdon. Mammals, p. 35.
1872. *Vesperugo* (*Pipistrellus*) *leucotis*, Dobson, J. A. S. B., XLI, p. 222.
♂ 2, ♀ 11, in al. 5, Kashmor; ♀ 1, Chak;
♂ 2, ♀ 1, Mirpur; ♂ 1, Sukkur.

There seems to be very little difference between these two forms, but as the specimens from Kashmor seem somewhat larger than those from Gambat. I have retained Blyth's sub-species.

(4) PIPISTRELLUS CEYLONICUS SUBCANUS, Thos.

The Northern Kelaart's Pipistrelle.

1915. *Pipistrellus ceylonicus subcanus*, Thomas. Journ., B. N. H. S. XXIV, p. 30.
♂ 2, ♀ 4, Lhandi.
(*See* also Reports No. 3, 10, 12 (under *P. ceylonicus*).

(5) PIPISTRELLUS MIMUS GLAUCILLUS, Wr.

The Northern Dwarf Pipistrelle.

1912. *Pipistrellus mimus glaucillus*, Wroughton, Journ., B. N. H. S. XXI p. 769.

This is a local race of *mimus* which I established on specimens from Multan. The present ones are still paler on the average.

(6) SCOTOPHILUS KUHLI, Leach.

The Common Yellow Bat.

(Synonymy in No. 1.)

♂ 9, ♀ 5, in al. 4. Kashmor; ♂ 1, ♀ 1, in al. 10, Chak;
♂ 3, ♀ 4, Sukkur; in al. 2, Jacobabad.
(*See* also Reports Nos. 3, 5, 6, 7, 9, 12, 14, 15, 16, 19, 20 and 23).

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"The commonest bat in the districts I collected in. They find an ideal refuge between the layers of mats which cover the ceilings of most Sindi houses."—S. H. P.

(7) SCOTEINUS PALLIDUS, Dobs.

The Desert Yellow Bat.

1876. *Scotophilus pallidus*, Dobson, Mon. As. Chir., p. 186.
1891. *Nycticejus pallidus*, Blanford, Mammalia, No. 196.

♂ 3, ♀ 2, in al. 1, Kashmor; ♂ 1, Mirpur; ♀ 2, Naundero.

I understand that with the exception of 4 specimens of this bat (including the type) in the Indian Museum, it is not represented in any Collection. It is a small bat with a head and body length of slightly over 2 inches and tail 1½ inches. As in *Scotophilus* there is only one upper incisor on each side. It has the true 'desert' coloration, *i.e.*, pale brown above and almost white below.

"These bats were taken in crevices of buildings."—S. H. P.

(8) TAPHOZOUS KACHHENSIS, Dobs.

The Cutch Sheath-tailed Bat.

(Synonymy in No. 1.)

♂ 17, in al. 3, Kashmor; ♂ 1, ♀ 3, in al. 12, Kot Diji;
(*See* also Reports Nos. 3, 8, 9, 10, 12, 19 and 23.)

"I took a large number of these bats in crevices in the wall of a brick building in Kashmor, where I also found *N. tragatus*."—S. H. P.

(9) RHINOPOMA KINNEARI, Wr.

The Greater Indian Mouse-tailed Bat.

(Synonymy in No. 3.)

♂ 1, ♀ 4, Sukkur; ♀ 6, Gambat.
(*See* also Reports Nos. 4, 10 and 19.)

When I established the species *kinneari* (Vol. XXI, p. 767), I had only males to deal with, while in this series with one exception all are females. The forearm of the type was recorded as 70 mm. and the present male gives about the same measurement but the females range from 63 to 66 mm. There is therefore a marked difference in size between the sexes. They appear to roost separately.

(10) RHINOPOMA HARDWICKEI, Gray.

The Lesser Indian Mouse-tailed Bat.

(Synonymy in No. 3.)

♂ 2, ♀ 1, Lhandi.
(*See* also Reports Nos. 5, 7, 8, 10, 12, 19 and 21.)

This is the Indian representative of the other group of the Genus *Rhinopoma*, including *cystops* (Egypt) and *muscatellum* (Arabia), of which it is also the largest species. Its very long tail and the globular swellings, above the nostrils, on the skull, make it easily recognisable from other Indian species.

(11) TADARIDA TRAGATA, Dobs.

Dobson's Wrinkle-lipped Bat.

(Synonymy in No. 3.)

♂ 2, ♀ 1, Kashmor; in al. 1, Sukkur.
(*See* also Reports Nos. 5, 9, 10 and 12.)

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(12) ERINACEUS MICROPUS, Blyth.

The Northern Pale Hedgehog.

(Synonymy in No. 3.)

♂ 3, ♀ 3, Gambat.

(*See* also Reports Nos. 10 and 12.)

"Hedgehogs are particularly scarce during the cold weather but come out as it grows warmer, when numbers of them may be met with strolling about after dusk. They seldom make any attempt to escape but roll themselves up and lie still."—S.H.P.

(13) ERINACEUS COLLARIS, Gray and Hardw.

Hardwickes Hedgehog.

(Synonymy in No. 3.)

♂ 1, Jacobabad; ♂ 1, ♀ 1, in al. 3, Chak; ♂ 2, ♀ 1, Sukkur; ♂ 3, ♀ 8, Mirpur; ♂ 3, Gambat; ♂ 1, Naundero.

(*See* also Report No. 12.)

(14) ERINACEUS BLANFORDI, And.

Anderson's Hedgehog.

1878. *Erinaceus blanfordi*, Anderson, J.A.S.B., XLVII, p. 208.
1878. *Erinaceus jerdoni*, Anderson, l.c.p. 209.

♂ 1, Chak; ♂ 1, Jacobabad; ♂ 1, Kashmor; ♂ 6, ♀ 3, Sukkur; ♂ 6, Naundero.

In a paper on the nomenclature of the Indian Hedgehogs in this Journal (Vol. XX, p. 80), I pointed out that the type of *blanfordi* had a bald parting on the forehead and was a synonym therefore not of *collaris* which has no such parting but of *jerdoni* and, as the older name, must be used for that species. Besides the bald patch on the forehead, *blanfordi*, though otherwise very like *collaris* may be at once distinguished from that species by its whitened face.

(15) PACHYURA SUBFULVA, And.

The Pale Northern Shrew.

1877. *Pachyura subfulva*, Anderson, J. A. S. B., XLVI, p. 278.

♂ 1, (juv.) ♀ 3, (2 juv.) in al. 2, Sukkur; ♂ 1, Naundero.

(*See* also Report No. 10.)

Anderson gave this name to a shrew taken by Stoliczka in Cutch, recording that the individual was quite a young one. Three of the specimens from Sukkur are young and the fourth is a nursing female. The young agree quite closely with Anderson's description of *subfulva* and the female may well be an adult specimen of the same species. I adopt the name therefore, for these, if not confidently, without much hesitation. The specimen from Naundero which is a ♂ fits by no means so well with the description and differs a good deal from the Sukkur female. There is no other name however available for it and I do not care to give it one until the whole group has been worked out afresh in detail. Blanford refers to this species at p. 241 of his Mammalia.

(16) FELIS AFFINIS, Gray.

The Jungle Cat.

(Synonymy in No. 1.)

♂ 3, ♀ 1, Jacobabad; ♂ 1, ♀ 1, Naundero.

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(*See* also Reports Nos. 1, 3, 4, 5, 6, 7, 10, 11, 12, 15, 16, 18, 19, 20 and 22.)

"Very common in the "kanh" grass jungles about Jacobabad. A specimen shot by me weighed 20 lbs."—S. H. P.

(17) FELIS ORNATA, Gray and Hardw.

The Indian Desert Cat.

(Synonymy in No. 3.)

♀1, Jacobabad: ♂1, Gambat.

(*See* also Report No 10.)

(18) FELIS, Sp. (Domestic.)

♂1, Sukkur.

A tame cat from Sukkur looking very much like an erythritic form of *ornata*.

(19) VIVERRICULA MALACCENSIS, Gmel.

The Small Indian Civet.

(Synonymy in No. 3.)

1, not sexed, no skull, Naundero.

(*See* also Reports Nos. 3, 5, 7, 10, 11, 12, 13, 15, 16, 18, 19, 20, 22 and 23.)

"I obtained a skin of one specimen at Naundero, Larkhana, where three others had been hunted down and killed by a local Zemindar."—S. H. P.

(20) MUNGOS MUNGO FERRUGINEUS, Blanf.

Blanford's Indian Mungoose.

1874. *Herpestes ferrugineus*, Blanford, P. Z. S., p. 661.
1888. *Herpestes mungo*, Blanford, Mammalia, No. 60 (*partim.*)
♂1, Chak; ♀1, Sukkur; ♂4, ♀4, Gambat.

(21) MUNGOS AUROPUNCTATUS PALLIPES, Blyth.

The Pale-footed Small Mungoose.

1945. *Herpestes pallipes*, Blyth, J. A. S. B., XIV, p. 346.
1888. *Herpestes auropunctatus*, Blanford, Mammalia, No. 58 (*partim.*)
♂1, Jacobabad; ♂1, Chak; ♂1, Sukkur; ♂1, ♀4, in al. 1, Gambat; ♂1, ♀1 (skulls only) Naundero.

This is a pale form but without the yellow tinge of *helvus* from Kathiawar.

(22) HYAENA HYAENA, L.

The Striped Hyaena.

(Synonymy in No. 1.)

♂1, Kot Diji; ♀1, Gambat.

(*See* also Reports Nos. 3, 4, 7, 15 and 19.)

(23) CANIS INDICUS, Hodgs.

The Common Jackal.

(Synonymy in No. 1.)

♂2, ♀2, Jacobabad; ♂1, Kashmor; ♂1, ♀4, Gambat; ♂4, Naundero.

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(*See* also all previous Reports except Nos. 2, 8, 13 and 17.)

"A darkish long haired variety is met with in the Upper Sind Frontier districts, which differs appreciably from skins obtained further south. They are very common about Jacobabad where I have seen them moving about in broad daylight."—S. H. P.

(24) VULPES BENGALENSIS, Shaw.

The Indian Fox.

(Synonymy in No. 1.)

♂ 1, ♀ 1, Mirpur; ♀ 1, Sukkur; (juv.) ♀ 2, Gambat (one juv.).

(*See* also Reports Nos. 3, 5, 7, 10, 12, 15, 19 and 23.)

"Is quite as common as *V. leucopus* in the semi-desert lands."—S.H.P.

(25) VULPES LEUCOPUS, Blyth.

The Indian Desert Fox.

(Synonymy in No. 3.)

♂ 1, Kashmor; ♀ 3 (2 juv.) Mirpur; ♂ 1, (juv.) ♀ 1 (juv.) in al. 1, Sukkur; ♂ 1, ♀ 1, (juv.) skulls only 2, Gambat.

(26) LUTRA MACRODUS, Gray.

The Smooth Indian Otter.

(Synonymy in No. 7.)

♂ 1, ♀ 1, Chak; ♂ 1, ♀ 3, 1 (not sexed, no skull), Eastern Nara.

(*See* also Reports Nos. 16 and 20.)

"Otters are not uncommon on the Indus and Eastern Nara. They are kept by the Muhanas (fishermen), who employ these animals as decoys in capturing Dolphins (*Platanista gangetica*) and fish. Two or three of these tame otters are let into the river and food in the shape of fish or prawns is thrown to them, whereupon there ensues a great mewing and splashing, which commotion attracts the fish who blunder into the nets prepared for them."—S. H. P.

(27) FUNAMBULUS PENNANTI ARGENTESCENS, Wr.

The Northern Five-striped Squirrel.

1891. *Sciurus palmarum*, Blanford, Mammalia, No. 253 (*partim*).
1905. *Funambulus pennanti argentescens*, Wroughton Journ., B. N. H. S., XVI, p. 413.

♂ 5, ♀ 1, Jacobabad; ♂ 4, ♀ 3, Kashmor; ♂ 2, Sukkur; ♂ 1, ♀ 1, Naundero.

(28) TATERA INDICA, Hardw.

The Indian Gerbil.

(Synonymy in No. 1.)

♂ 12, ♀ 3, in al. 2, Jacobabad; ♂ 5, ♀ 1, Kashmor; ♀ 1, Sukkur.

(*See* also Reports Nos. 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 19, 21 and 22.)

(29) MERIONES HURRIANÆ, Jerd.

The Indian Desert Gerbil.

(Synonymy in No. 3.)

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♂ 3, ♀ 4, Mirpur; ♂ 1, Sukkur; ♂ 5, ♀ 10, Gambat; ♂ 1, Lhandi.

(*See* also Reports Nos. 10 and 12.)

"Swarm in desert and semi-desert portions of the country. This animal is by no means nocturnal and all my specimens were obtained in broad daylight. They live in little colonies and are particularly partial to "bands" and railway cuttings; when disturbed the little fellows scamper away into their burrows, but if you keep still, first one head pops out and then another till one bolder than the rest sits up to get a better view, or stands on his hind legs, when he considers all safe he ventures out to be shortly followed by the rest of his brethren. I nearly always found these colonies in the vicinity of those milky plants (*Calotropis gigantea* or *procera*), the gerbils feed on the flowers and spend much of their time in carrying the leaves away into their burrows."—S. H. P.

(30) DIPODILLUS NANUS, Blanf.

The Little Gerbil.

(Synonymy in No. 10.)

♂ 1, not sexed 1, (juv.) Sukkur; ♂ 1, Gambat.

(*See* also Report No. 12.)

"I obtained two specimens at Sukkur and one at Gambat. These animals will only be found where the sand is very fine and soft such as in some of the canal beds."—S. H. P.

(31) MUS BACTRIANUS, Blyth.

The Persian House Mouse.

1846. *Mus bactrianus*, Blyth, J. S. S. B., XV., p. 140.
1854. *Mus gerbillinus*, Blyth., J. S. S. B., XXIII., p. 410.
1854. *Mus theobaldi*, Blyth., l. c. p. 583.
1891. *Mus bactrianus*, Blanford, Mammalia, No. 283.

♂ 18, ♀ 14, in al. 18, Jacobabad; ♂ 2, Kashmor; ♀ 1, Chak; ♂ 3, Gambat; ♂ 9, ♀ 4, Naundero.

The type locality of *bactrianus* is Kandahar, while *gerbillinus* and *theobaldi* were described from the Salt Range. The descriptions of all three are very meagre but there are some topotypes of *bactrianus* from Kandahar in the National Collection with which the present series agree very fairly. In my Report on Kumaon I spoke of three distinct types of Indian House mice but further material seems to show that there are really only two, *viz.*, the brown bellied (*dubius*, *manei*) found in the plains and the white bellied (*homourus*, *bactrianus*, &c.) from the Himalayas and N. W. Frontier. When representative topotypes from the Salt Range are available the whole group will no doubt repay a detailed examination.

(32) RATTUS RUFESCENS, Gray.

The Common Indian Rat.

(Synonymy in No. 1.)

♂ 3, Jacobabad; ♂ 2, ♀ 3, Kashmer; ♂ 1, Gambat.

Variety with white underparts:—♀ 2, Jacobabad; ♂ 1, Gambat.

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(33) NESOKIA INDICA, Gray and Hardw.

The Rajputana Short-tailed Mole Rat.

1832. *Arvicola indica*, Gray and Hardwicke III; Ind. Zool., I. pl. XI.
1837. *Mus hardwickei*, Gray, Mag. N. H. I., p. 585.
1891. *Nesocia hardwickei*, Blanford, Mammalia, No. 294.
♂ 2, Chak; ♂ 1 (juv.), Gambat.

This Genus replaces *Gunomys* in the North. The present is the most southern species, others are found throughout Central Asia and Persia, extending to Transcaspia, Palestine and Upper Egypt. It is for the most part more brightly coloured than *Gunomys* and has a markedly shorter tail. The mammary formula is 2-2=8 while *Gunomys* is multimammate.

"Common in the cultivated lands on the banks of the Indus this rat is very fond of water to which it takes quite readily. In some years the mole rats become a great pest in Sind and do a deal of damage to the crops."—S. H. P.

(34) GOLUNDA ELLIOTI WATSONI, Blanf.

The Northern Indian Bush Rat.

(Synonymy in No. 12.)

♀ 3, Jacobabad; ♂ 2, ♀ 3, in al. 1, Sukkur; ♀ 1, in al. 2 (*fœtus*), ♂ 2, ♀ 1, Naundero.

(*See* also Reports 3 and 10 (under the name *G. ellioti*).

(35) ACANTHION LEUCURUS CUNEICEPS, Wr.

The Rajputana Porcupine.

♂ 1, ♀ 1, Merpur; ♂ 1, ♀ 3, in al. 1; ♂ 4, ♀ 2, Mirwah.

(*See* also Report No. 3.)

Mr. Thomas who kindly examined these Porcupines for me has given me the following note:—"The Sind Porcupines may be assigned to the sub-species *cuneiceps* described on an example from Cutch. Its chief character is its smaller size, the peculiar unswollen shape of the type skull proving not to be constant. It also averages lighter in colour as the white on the spines is more extended.

It may be noted that, although Dr. Lyon (Proc. U. S. Nat. Mus. XXXI, p. 575), only refers the Malayan Porcupines to the Genus *Acanthion*, the Indian species *leucurus* is certainly assignable to the same genus and equally differs from the typical *Hystrix* of S. Europe and Africa."

"These are common in cultivated lands and are responsible for a deal of the damage done to crops. The stomach of the porcupine is greatly valued by Sindis as a febrifuge. It is removed from the animal and dried in the sun. The quills are also said to possess medicinal properties."—S. H. P.

(36) LEPUS DAYANUS, Blanf.

The Sind Hare.

(Synonymy in No. 3.)

♂ 6, ♀ 1, Jacobabad; ♂ 2 Kashmer; ♂ 2, 1 (not sexed), Chak; ♂ 1, Gari Yasin; ♀ 1, Gotgi; ♀ 3, Mirpur; ♂ 2, Sukkur; ♂ 2, Gambat; Skulls only 4, Naundero.

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(*See* also Reports Nos. 10 and 12.)

The type locality of *L. dayanus* is Sukkur so that this series are practically topotypes.

(37) ANTILOPE CERVICAPRA, L.

The Black-buck.

(Synonymy in No. 1.)

♂ 1, Gambat.

(*See* also Reports Nos. 1, 3, 7, 10 and 21.)

(38) GAZELLA BENNETTII, Sykes.

The Indian Gazelle.

(Synonymy in No. 1.)

♂ 1, ♀ 1, Chak; ♂ 2, Gambat.

(39) SUS CRISTATUS, Wagn.

The Indian Wild Boar.

(Synonymy in No. 5.)

♂ 1, Jacobabad; ♂ 2, Gambat.

REPORT No. 25.

BY R. C. WROUGHTON.

COLLECTION ... ... No. 25.

LOCALITY ... ... Chin Hills.

DATE ... ... July 1914—April 1915.

COLLECTED BY ... ... Mr. J. M. D. Mackenzie, I.F.S.

EARLIER REPORTS ... .. No. 1, East Khandesh, Vol. XXI, p. 392, 1912; No. 2, Berars, Vol. XXI, p. 820, 1912; No. 3, Cutch, Vol. XXI, p. 826, 1912; No. 4, Nimar, Vol. XXI, p. 944, 1912; No. 5, Dharwar, Vol. XXI, p. 1170, 1912; No. 6, Kanara, Vol. XXII, p. 29, 1913; No. 7, Central Provinces, Vol. XXII, p. 45, 1913; No. 8, Bellary, Vol. XXII, p. 58, 1913; No. 9, Mysore, Vol. XXII, p. 283, 1913; No. 10, Kathiawar, Vol. XXII, p. 464, 1913; No. 11, Coorg, Vol. XXII, p. 486, 1913; No. 12, Palanpur, Vol. XXII, p. 684, 1913; No. 13, South Ceylon, Vol. XXII, p. 700, 1913; No. 14, Shan States, Vol. XXII, p. 710; No. 15, Kumaon, Vol. XXIII, p. 282, 1914; No. 16, Dry Zone, Central Burma and Mt. Popa, Vol. XXIII, p. 460, 1915; No. 17, Tenasserim, Vol. XXIII, p. 695, 1915; No. 18, Ceylon, Vol. XXIV, p. 79, 1915; No. 19, Bengal, Vol. XXIV, p. 96, 1915; No. 20, Chindwin, Vol. XXIV, p. 291, 1916; No. 21, Gwalior, Vol. XXIV, p. 309, 1916; No. 22, Koyna Valley, Vol. XXIV, p. 311, 1916; No. 23, Sikkim, Vol. XXIV, p. 468, 1916; No. 24, Sind, Vol. XXIV, p. 749, 1916.

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This most interesting and valuable Collection, contributed to the Indian Mammal Survey by Mr. J. M. D. Mackenzie, I.F.S., may be treated as a continuation of the Chindwin Collection, in my Report on which a certain number of these specimens were included.

A part of it was obtained in the Chindwin Valley, near Kindat, but more to the west than the country covered by Mr. Shortridge, and includes specimens from the Kabaw Valley, while the balance represents the Fauna of the Chin Hills.

The following is a note on the areas over which he collected, by Mr. Mackenzie:—" From 10m. south to 20m. north of Kindat the country west of the river consists of (1) flat paddy land up to 4 or 5 miles, (2) a mile or two of open and scrub jungle, (3) a belt, about 20 miles wide, of forest containing teak and other large trees; it is mostly dry and very hilly, though the highest point is only about 3,200 feet, and most of the hills are considerably less, about 1,500 to 2,000 feet. The jungle is mostly fairly thick, but patches of 'indaing' and evergreen jungle occur. (4) the Kabaw Valley, which is some 10 miles across and consists mostly of flat country covered with scrub jungle; a few villages, with cultivated land round them, mixed with 'pongoes' (*i. e.*, old cultivation) occur, and scattered through the whole are patches of bigger jungle and 'kaing' (elephant grass). Finally on the western boundary of the Kabaw Valley lie the Chin Hills in the south, and Manipur in the north.

The part of the Chin Hills in which collections were made lies between the southern boundary of Manipur and the southern watershed of the Nankathit Chaug, an area of some 500 square miles, more or less triangular in shape, with the Kabaw Valley for the base. It is about 20 miles from north to south, in the centre, and 30 from east to west. The country consists of steep hills, ranging from 3,000 to 7,000 feet, with rocky, swift-flowing streams in the valleys. The hills are very steep and stony, and usually covered with jungle, both scrub (tree heather, hornbeam, oak, &c.), and high forest containing large trees. In the latter especially the undergrowth is very thick. The Chins live in villages usually placed on the tops of high ridges, and practise shifting cultivation ('taungya') in the course of which all tree growth on the selected area is cut down and burnt; the area after a year or two is abandoned.

The Collection contains 346 specimens, belonging to 52 species and subspecies, in 36 genera. No less than 4 forms have had to be provided with names, and it is much to be regretted that owing to Mr. Mackenzie's illness many skulls were lost as otherwise this list might have been still longer. These new names are as follows:— *Petaurista sybilla*, *Tomeutes mearsi virgo*, *Rattus mackenziei*, and *Rattus manipulus*. In addition to these, 7 forms are new to the

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lists of the Survey, *viz.*:—*Nyctalus labiatus*, *Nyctalus joffrei*, *Murina tubinaris*, *Crocidura rubricosa*, *Anourosorex squamipes*, *Tomeutes mearsi mearsi*, and *Dremomys pernyi*.

It will be noted that I have claimed *Tomeutes mearsi mearsi* as new to our list, though employed in the Chindwin Report, but the specimens of the Summer form, taken by Mr. Mackenzie, low down on the Chindwin show that the name was not applicable as there used, and that the form in Summer pelage taken by Mr. Shortridge at and north of Kindat correspond with the series in Winter coat now sent by Mr. Mackenzie from the same locality. To this northern form has been given the subspecific name *virgo*. There is yet another local form intermediate in habitat between *T. mearsi mearsi* at Monywa and *T. mearsi virgo* at Kindat (*i. e.*, at or near Kin), which Mr. Mackenzie did not come across, and of which Mr. Shortridge only sent Summer specimens. Winter specimens of this form are a great desideratum.

While this collection has thus helped to settle the doubts surrounding *T. mearsi* and its subspecies, it has in its turn raised a question affecting *Dremomys macmillani*, whose most noticeable feature hitherto has been a black, median, dorsal stripe; Mr. Mackenzie's series from neighbouring localities contains some specimens in new fur with the dorsal stripe and some in old fur without it, thus suggesting that possibly the dorsal stripe is a seasonal character like the hip-patch in *Tomeutes*. Specimens taken at different seasons (preferably midwinter and midsummer) would be most valuable.

In addition to the animals actually collected by him, Mr. Mackenzie gives the following list of others occurring in this region :—

Pteropus sp.—" Said to be common in Manipur, and to be occasionally seen in the lowest valleys of the Chin Hills and at Tamu." —J.M.D.M.

Felis tigris.—" Common. I have never heard one roar, but I have often heard them 'titting' like sambhar. Only once have I been able to hear the difference between the calls of the two animals; I was following a sambhar about a minute ahead of me, when a tiger came between me and my quarry, I could not see him because the jungle was too thick, but I could hear both beasts 'titting.' My hunters always profess to know the difference, and I have found them to be correct whenever we have found the tracks later. Vernacular name: SHAHAM (Chin)."—J.M.D.M.

Felis pardus.—" Fairly common near villages. I saw one in a trap newly killed, the owner wanted Rs. 20 (the Government reward), eight annas for each whisker hair, and one rupee for each claw, this being, apparently, the local price for these things as charms. He also wanted to keep the skull for a feast (including the drinking of large quantities of beer) to celebrate the death. This was at

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5,000 feet, 65 miles west of Kindat, it measured, H & B 1111, Tl. 809, Hf. 241, Ear 75mm.

Vernacular name: CHET THIT (Burmese)."—J.M.D.M.

Felis nebulosa.—"I have heard of one brought into Tamu from Manipur, of a second shot near Maingyaung, east of the river, and of a third picked up dead and decomposed in the lower Chindwin.

Vernacular names for all cats: TAW CHAUNG (Burmese); SUNG AK (Chin.)"—J.M.D.M.

Felis affinis.—"Common. I have seen only one."—J.M.D.M.

Cuon dukhunensis.—"A wild dog is pretty numerous. I have seen a pack of 9 chasing a herd of pig, and have seen two beasts quite close when I had no gun handy. On two or three other occasions I have seen packs at a distance; I cannot be certain, but I think they are *C. dukhunensis*, as I compared them at the time to a smallish fox hound. Mr. Nixon, I.F.S., saw a pack hunt a serow almost to his feet, and I have twice picked up skulls of serows killed by wild dogs. In one fortnight I saw, and heard from my coolies, of 9 sambhar all freshly killed by wild dogs. At Ahlaw, in the Kabaw Valley, I once came on 6 beasts engaged in cutting out a buffalo calf from the herd, in paddy fields, within half a mile of the village. Wild dogs do immeasurably more damage to game even than natives; even bison appear to leave the district after dogs have been there a week, while sambhar and barking deer go in a day or two.

Vernacular name: TAW QUAY (Burmese)."—J.M.D.M.

Helictis personata (?).—"I have seen a beast which I am nearly sure was this." J.M.D.M.

Acanthion sp.—"A porcupine occurs, I have heard it, seen quills and tracks."—J.M.D.M.

Elephants.—"Only occur in the Chin Hills at the lower levels up to 2,000 feet. In the Chindwin they are fairly common. A tame elephant belonging to the Bombay-Burma Trading Corporation once gave birth to a calf within 300 yards of my camp and for several days, every evening, 4 or 5 females, who were at the time without maternal responsibilities, came down to look on, with much grunting and squealing. The calf could walk in two days, it fed by the mouth and seemed to find its trunk a very useless and inconvenient appendage. The mother was quite docile.

Vernacular name: SIN (Burmese). "—J.M.D.M.

Rhinoceros sp.—"I have seen tracks on the east side of the Kabaw Valley at 3,000 feet and have several times heard of them from villagers.

Vernacular name: CHAW (Burmese)."—J.M.D.M.

Bibos gaurus.—"Fairly common in the Chindwin, but very scarce in the Chin Hills, where it is persistently hunted.

Vernacular name, ZANG SHIEL or YANG SHIEL (Chin)." J.M.D.M.

Bibos frontalis.—"Kept domesticated.

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Vernacular names: NANOUK (Burmese); SHIEL (Chin)."—J.M.D.M.

Bibos sondaicus.—"Fairly common in suitable places."—J.M.D.M.

Capricornis sumatrensis.—"I am practically certain it is the subspecies *rubidus*. This serow is not uncommon."—J.M.D.M.

Rusa unicolor.—"Fairly common. I measured a head, belonging to Mr. Hepburn, B.B.T.C., killed on the Yu River. Length, R. 32, L. 30¼; widest spread, 22; beam, R. 6¾; £. 6½; length of brow tines, R. 13, L. 12. This is, so far as I know, the best head from the district.

Cervus porcinus.—"Occurs in suitable localities. This is said by Burmans to be a bigger and a darker beast, called by them KAING-SAT, living in large areas of 'kaing' (elephant grass). It is said to occur east of the river. I have never seen one."—J.M.D.M.

Sus sp.—"Common."—J.M.D.M.

Manis sp.—"Recognised by natives from a picture, but is said to be very scarce."—J.M.D.M.

Orcäëlla fluminalis.—"A porpoise occurs at Homalin."—J.M.D.M.

There is considerable doubt whether the Irrawaddy porpoise is specifically distinct from *brevirostris*, and specimens of this Chindwin porpoise would therefore be of great value. A skull and a strip of skin from the centre of the animal (taken round the circumference) or perhaps even better a good carefully made water colour drawing would suffice.

In congratulating Mr. Mackenzie on the success of his first effort, by no means his last let us most sincerely hope, I would venture to urge upon him and any other member who may decide to help us the vital necessity of care in the labelling of skulls so that there shall be no possibility of doubt as to which skin corresponds with each skull.

(1) HYLOBATES HOOLOCK, Hard.

The Hoolock.

(Synonymy in No. 14.)

♂ 1, Kabaw Valley; not sexed 1, Chin Hills, 50 m., W.

(*See* also Report No. 20.)

"All the males I have seen have been black and most of the females grey; but I had one, a young female, about 2 months old, brought in in February, which was black. It soon got tame, but died after about 6 months in captivity. It used to drink in the ordinary way, by putting its lips to the water, but when just brought in, drank milk by dipping its knuckles into the saucer and sucking them.

Chiefly inhabits the heavier jungle on the hills where it can always be heard on the west of the river. I have seen it up to 5,000 feet and it is said to go up to 7,000. I have twice seen parties of 3 in the Kabaw Valley, on the level, both times in the hot weather. It is generally found in parties of 3 or 4, but I have seen single ones, and once a party of six. Burmans and Chins eat the flesh, I have tried it myself but found the flavour very strong."—J.M.D.M.

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(2) MACACA ASSAMENSIS, McCl.

The Himalayan Monkey.

(Synonymy in No. 16.)

♂ 1, ♀ 1, Atechg. 20 miles S. W. of Kindat.

(*See* also Report No. 20.)

"One or two skins sent. Common, especially near cultivation; big herds are also met with in the jungle. Burmans sometimes eat the flesh.

Vernacular name: MYOUK SAT (Burmese)."—J.M.D.M.

(3) PITHECUS PHAYREI, Bly.

Phayre's Leaf Monkey.

(Synonymy in No. 14.)

♀ 2, Letsigan.

(*See* also Reports Nos. 16 and 20.)

Mr. Thomas has recently published a paper (A.M.N.H., Vol. XVII, p. 179) in which, for reasons advanced, he advocates the use of the name *Pithecus* for the Langurs and that of *Macaca* for the Macaques. He writes: "It appears to me no great harm if a fresh and far earlier name be attached to it (*i.e.*, the langurs) and, in fact, at the cost of one more change after many, by putting its date further back, rendering the name of the genus far more stable than has hitherto seemed likely ever to be the case." I have therefore adopted this nomenclature and can only express a hope that Mr. Thomas is correct in his estimate of its stability. This change will necessitate the substitution of *Pithecus* for *Presbytis*, wherever the latter occurs in these reports and a similar substitution of *Macaca* for *Simia* in reports up to No. 14 and for *Pithecus* in all later reports up to date.

"Pretty common, more so at some distance from villages. Of 2 females shot, at about 3,000 feet, from a herd of 20 or so, on the 10th of February 1915, one was in milk, the other contained a single ¾ grown fœtus (with no hair on). Burmans eat the flesh. Weight 17 and 15 lbs."—J.M.D.M.

(4) NYCTICEBUS COUCANG, Bodd.

The Slow Loris.

(Synonymy in No. 17.)

♂ 1, 20 miles W. of Kindat.

The type locality is "Bengal."

This is a much more brightly coloured specimen than the one from Tenasserim. It comes from much nearer the type locality of *coucang* and is therefore more likely to be true *coucang*, until topotypes are available, however, the whole question must remain open.

"Not very scarce, but keeps hidden until absolutely dark. The Chins use the fur, as Europeans use cobwebs, to stop bleeding; it is said to be very efficacious. The stomach contained green food (leaves and shoots), fruit, a beetle, and a small piece of bone, apparently from a small bird. The digits of all four feet were tightly clenched in death. I have a young one alive at present but it refuses to become at all tame. It sleeps rolled up in a ball, with the head right between the thighs. Its food consists of fruit of all kinds. It moves in a most peculiar way very slowly and deliberately, putting the hindfoot right up to the front one, then moving

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the front foot, then the opposite hindfoot and frontfoot and so on, bending the back in an extraordinary way. It both ca an d does bite badly and seems very nervous. Weight 2½ lbs.

Vernacular name: MYOUK LAY WAY (Burmese)."—J.M.D.M.

(5) CYNOPTERUS SPHINX, Vahl.

The Southern Short-nosed Fruit Bat.

(Synonymy in No. 6.)

♂ 1, Kindat.

(*See* also Reports Nos. 9, 11, 13, 14, 15, 18, 19, 20 and 23.)

(6) RHINOLOPHUS PERNIGER, Hodgs.

The Himalayan Horseshoe Bat.

(Synonymy in No. 14.)

♂ 1, ♀ 1, Chin Hills, 40m., W.

(*See* also Report No. 23.)

"In a hollow tree.

Vernacular name for all Bats: LINOK (Burmese); BAAK or VAAK."—J.M.D.M.

(7) HIPPOSIDEROS ARMIGER, Hodgs.

The Great Himalayan Leaf-nosed Bat.

(Synonymy in No. 14.)

♂ 8, ♀ 4, in al. 4, Chin Hills, 15m., W.

(*See* also Reports Nos. 15, 16 and 20.)

"Caught in a cave at 2,000 feet."—J.M.D.M.

(8) NYCTALUS LABIATUS, Hodgs.

The Indian Noctule Bat.

1835. *Vesperugo labiatus*, Hodgson, J.A.S.B., IV., p. 700.
1845. *Noctulinia noctula*, Blyth., J.A.S.B., IV., p. 340.
1891. *Vesperugo noctula*, Blanford, Mammalia, No. 181.

♂ 1, Chin Hills, 60m., W., in al. 1, Tamanthe.

(9) NYCTALUS JOFFREI, Thos.

The Chin Noctule Bat.

1915. *Nyctalus joffrei*, Thomas, A.M.N.H. (8), Vol. XV., p. 225.

♂ 1, ♀ 2, in al. 2, Chin Hills, 60m., W.

"In *Ficus* bound trees."—J.M.D.M.

(10) PIPISTRELLUS MIMUS, Wr.

The Southern Dwarf Pipistrel.

(Synonymy in No. 1.)

♂ 1, Kabaw Valley.

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(11) SCOTOPHILUS KUHLI, Leach.

The Common Yellow Bat.

(Synonymy in No. 1.)

♂ 1, Kawya, 160 miles N. of Kindat.

(*See* also Reports Nos. 3, 5, 6, 7, 9, 13, 14, 15, 16, 19, 20, 23 and 24.)

(12) TYLONYCTERIS FULVIDA, Bl.

The Pale Club-footed Bat.

1859. *Scotophilus fulvidus*, Blyth., J.A.S.B., XXVIII., p. 293.
1891. *Vesperugo pachypus*, Blanford, Mammalia, No. 180.
♂ 1, Kindat.

(*See* also Reports Nos. 14, 17, 20, 23 under *T. pachypus*.)

(13) MURINA TUBINARIS, Sc.

Scully's Tube-nosed Bat.

1881. *Harpiocephalus tubinaris*, Scully., P. Z. S., p. 200.
1891. *Harpyiocephalus tubinaris*, Blanford, Mammalia, No. 198.
♂ 3, ♀ 3, not sexed 1, in al. 4, Chin Hills, 50m., W.
All from *Ficus* bound trees"—J.M.D.M.

(14) MURINA CYCLOTIS, Dobs.

The Round-eared Tube-nosed Bat.

(Synonymy in No. 23.)

♀ 2, in al. 1, Chin Hills, 50m., W.
"In hollow bamboos."—J.M.D.M.

(15) TUPAIA BELANGERI SICCATA, Thos.

The Burmese Tree Shrew.

(Synonymy in No. 16.)

♀ 2, 20 miles W. of Kindat; ♂ 1, ♀ 1, 20 miles S.-W. of Kindat; ♂ 1, ♀ 2, Kindat; ♀ 1, not sexed 1, Chin Hills, 50m., W.

(*See* also Reports Nos. 14 (under *T. chinensis*) and 29.)

"Fairly common, but not easy to secure; when shot they are generally badly smashed up, as they live in heavy jungle. Found both in forest and near villages. All shot were found to have a curious orange patch on the rump, apparently eggs producing 6-legged, round animals about half as big as a pin's head."—J.M.D.M.

(16) TALPA sp.

These specimens have not been received.

"Specimens sent a female with 3 juv. I saw their tunnels crossing the road on two or three occasions. Chins say they are not really scarce. The specimen caught had a nest rather like that of the English mole. It was destroyed (dug up) when I saw it. Is said to be found in jungle not in 'taungyas'.

Vernacular name: BWAKE (Chin)."—J.M.D.M.

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(17) CROCIDURA RUBRICOSA, And.

Anderson's Assam Shrew.

1877. *Crocidura rubricosa*, Anderson, J.A.S.B., XLVI., p. 280.
1888. *Crocidura fuliginosa*, Blanford, Mammalia, No. 126 (*partim.*)
♀ 4, in al. 3, Chin Hills, 50m., W; ♀ 1, Chin Hills, 65m.,) W. in al. 3, Kabaw Valley, 20m., W; various localities, too young for any identification.

I place these specimens under this name provisionally. The type of *rubricosa* was from Sibsagar, Assam.

"Vernacular name: TSICKPU (Chin)."—J.M.D.M.

(18) ANOUROSOREX SQUAMIPES, M. Edw.

The Chinese Short-tailed Shrew.

1870. *Anourosorex squamipes*, Milne-Edwards, C. R. Acad. Sc., LXX. p. 341.
1888. *Anurosorex squamipes*, Blanford, Mammalia, p. 245.
♀ 1, not sexed 1, in al. 2, Chin Hills, 50m., W.

Mr. Thomas, who kindly examined these specimens for me, has furnished the following note:—"After very careful examination I fail to find any character by which this animal can be distinguished from the *A. squamipes* of Sze-chwan. This particular specimen is grey while the majority of our Chinese examples are dark slaty, but among a series, sent us by Mr. W. R. Brown, from Chung King, there occur both slaty and grey specimens. The difference may be due to bleaching.

If this specimen represents *A. assamensis*, of which we have no specimen in our Collection, the assertion that that animal "has a longer tail than *A. squamipes*," is not borne out by our material, as its tail is only of the same length as those of a number of the Chinese examples.

All the skulls before me appear to be identical, but it must be admitted that that of the type of *assamensis*, as measured by Anderson, is longer than any of our series, so that it is possible, though not very probable, that while the Chin Hills' shrew is the same as the Chinese one, the Assam one is different from both. The type skull of *assamensis* measured 26·6 mm. in greatest median length, while Mr. Mackenzie's example measures 24·8 which is about as long as the longest of the Chinese skulls."

(19) FELIS BENGALENSIS, Kerr.

The Leopard Cat.

(Synonymy in No. 11.)

♀ 1 juv., not sexed 2, no skulls 4, Chin Hills, 50m., W.

(20) VIVERRA ZIBETHA, L.

The Large Indian Civet.

(Synonymy in No. 14.)

Not sexed 1, Kindat, 25m., W; not sexed 1 (included in the Chindwin Report, under No. 27) Mr. Mackenzie writes of this specimen "given to me by Mr. Milton of the Bombay-Burma Trading Corporation, and by me to Mr. Shortridge. The locality should be 'Ngapun', it is 20 miles north and 10 miles west of Kindat, and some 25 or 30 miles east of the Manipur border."

(*See* also Reports Nos. 20 and 23.)

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"Fairly common and a great fowl thief. I saw and shot a pair in the jungle, which I think were this species, they were sitting over a small pool in a stream, and fishing. The stomachs contained 4 and 5 practically undigested fish, about 3 inches long, with the heads bitten off. I could find no trace of the heads, which is curious, as most beasts regard the heads of their prey as rather a delicacy.

"Vernacular name: CHOUNG DWIN SE."—J.M.D.M.

(21) VIVERRICULA MALACCENSIS, Gmel.

The Small Indian Civet.

(Synonymy in No. 3.)

♀1 juv. (recorded in Chindwin Report under No. 29), Kindat; no skulls 2, Chin Hills, 50m., W.

(*See* also Reports Nos. 3, 5, 7, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 27.)

(22) PRIONODON PARDICOLOR, Hodgs.

The Spotted Tiger Civet.

(Synonymy in No. 23.)

No skull 1, Chin Hills, 50m., W.

(*See* also Report No. 25.)

(23) PAGUMA GRAYI.

The Himalayan Palm Civet.

(Synonymy in No. 15.)

Not sexed 1, no skulls 2, Chin Hills, 50-60mW.

"Eaten by the Chins. Said to live on fruits and roots.

"Vernacular name: SA GYAW (Chin)."—J.M.D.M.

(*See* also Reports Nos. 23 and 25.)

(24) MUNGOS URVA, Hodgs.

The Crab-eating Mongoose.

(Synonymy in No. 23.)

♀1, Tamu.

(*See* also Report No. 17 supp.)

(25) CANIS INDICUS, Hodgs.

The Bengal Jackal.

(Synonymy in No. 5.)

Skull only 1, Chin Hills, 50m., W.

"It is said to be an occasional visitor at Tamu, probably coming over from Manipur.

"Vernacular name: QUAY AT (Burmese)."—J.M.D.M.

(*See* also Reports Nos. 14, 16, 19, 20, 23, 25, 27.)

(26) MARTES FLAVIGULA, Bodd.

The Northern Indian Marten.

(Synonymy in No. 15.)

♂1, Kabaw Valley, 20mW; not sexed 1, Chin Hills, 50mW.

"I have seen a pack of 5 hunting at 10 a.m. close to Kindat. Reliable Burmans tell me 3 or 4 will attack an unarmed man. Weight 5¾ lbs.

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"Vernacular name: NABASHING (Burmese, a name also applied to at least one other small carnivore, of whose identity I am uncertain); SHACHAH (Chin).—J.M.D.M.

(*See* also Reports Nos. 20, 23, 25 and 27.)

(27) MUSTELA STRIGIDORSA, Gray.

The Striped Weasel.

1853. *Mustela strigidorsa*, Gray, P. Z. S., p. 191.
1888. *Putorius strigidorsus*, Blanford, Mammalia, No. 86.
No skull, Chin Hills, 50m., W.

Hodgson never published this name, so that the responsibility for it rests with Gray, who published it as *strigodorsa* but as he at the same time stated that the name was taken from Hodgson's Mss. I have adopted the present spelling, which is that used by Hodgson.

(28) ARCTONYX COLLARIS, F. Cuv.

The Hog-Badger.

1825. *Arctonyx collaris*, F. Cuvier, Hist. Nat. Mamm., pl. 220.
1856. *Arctonyx isonyx*, Hodgson, P.Z.S., p. 398.
♂ 1, Kindat, 30m., N. W.

"*A. collaris* and *taxoides*, both shot within 10 miles of the boundary, in the Kabaw Valley, and so probably occur in the Chin Hills."—J.M.D.M.

Only one specimen was received, which is almost certainly *collaris*. The British Museum Collection contains no specimen of *taxoides* and only one authenticated one of *collaris*. Thus the loss of Mr. Mackenzie's specimen of *taxoides* is very much to be regretted.

(29) LUTRA MACRODUS, Gray.

The Smooth Indian Otter.

(Synonymy in No. 7.)

No skull 1, above Kindat (recorded in the Chindwin Report under 35); ♂ 2, Kindat, 6m., W.

(*See* also Reports Nos. 16, 20 and 24.)

"Common. I have seen parties of six, and have heard, on good authority, of parties of 8, 9, and 10 fishing together in the Chindwin River. I have also seen them in the Kabaw Valley."—J.M.D.M.

(30) AONYX CINEREA, Illig.

The Clawless Otter.

(Synonymy in No. 11.)

No skulls 2, Chin Hills (recorded in Chindwin Report under 34).

"My skins came from 2,500 feet, and 5 miles west of the boundary. Vernacular name: S'HAAM (Chin)."

(*See* also Reports Nos. 15, 16 and 20.)

(31) URSUS TORQUATUS, Wagn.

The Himalayan Black Bear.

1841. *Ursus torquatus*, Wagner, Schreb. Saug. Supp. II, p. 144.
1888. *Ursus torquatus*, Blanford, Mammalia, No. 98.
Ol juv., Kindat.

Recently, (P. Z. S., 1909, p. 607). Lydekker discussed the question of the Himalayan Black Bear. For reasons recorded he held that the *thibetanus* of Cuvier was quite distinct from *torquatus*. He, at the same

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time, basing on certain skull characters, described a subspecies *macneilli*, from Assam. Geographically the present specimen probably belongs to this form, but its extreme youth, and the absence of a skull make it impossible to form a conficent opinion, so I have judged it safest to use the older name.

(32) PETAURISTA CANDIDULUS, Wr.

The Chindwin Flying Squirrel.

(Synonymy in No. 20.)

♂ 2, ♀ 3, not sexed 1, skull only 1, Kindat, up to 20 miles; ♂ 1, Chin Hills, 50m., W.

"Fairly common in forests, but not easy to shoot. They come at night to feed on the fruit of the *Pyingado*. The seeds are all eaten before ripe, by biting along the edge of the pod, and ripping off one side. At night at least they appear to be fearless; shouting does not disturb them at all and even a gun shot, unless the shot pass fairly close, only causes the noise of munching to stop for a minute. On the ground they are savage, and bite hard but luckily they are clumsy. My Chins tell me they live in large nests of twigs and leaves (like a squirrel's dray, but larger and flimsier) during the day in the hot and cold weather. In the rains they live in holes in trees. Weight 5-6 lbs. Slightly in milk at the end of December and also in March, so apparently suckles young all the year round."—J.M.D.M.

(33) PETAURISTA SYBILLA, Thos. and Wr.

The Lesser Chindwin Flying Squirrel.

1916. *Petaurista sybilla*, Thomas and Wroughton, Journ. B. N. H. S. Vol. XXIV., p. 423.

♂ 1, ♀ 1, Chin Hills, 50 m., W.

"I have not seen this species before, but J. C. Hopwood got some 20 or 25 skins in 1914. Shot in a nest at 5,000 feet, close to a village."—J.M.D.M.

This beautiful Flying Squirrel belongs to a group distinct from *candidulus*, being smaller, and having a smaller, more delicately formed skull. It is various shades of ochraceous above and ochraceous buff below.

(34) PTEROMYS ALBONIGER, Hodgs.

The Parti-coloured Flying Squirrel.

(Synonymy in No. 20.)

(No skulls 3, Manipur, recorded in Chindwin Report under 38); ♂ 3, ♀ 3, no skulls 5, Chin Hills, 50m., W.; ♂ 1 (no skull), 30 miles W. of Kindat.

(*See* also Reports Nos. 17 Supp. and 23.)

(35) PTEROMYS sp. (*Phayrei* group).

No skull 1, Manipur (recorded in Chindwin Report under 39); no skulls 9, Chin Hills, 50m., W.

(36) RATUFA GIGANTEA LUTRINA, Thos. and Wr.

The Pale Assam Giant Squirrel.

(Synonymy in No. 20.)

♀ 3, Kabaw Valley; ♂ 3, ♀ 3.. Kindat up to 20 ms. S. W.; ♂ 1, Chin Hills, 40m., W.

"Common, but appears to leave the hills during April and May. Eaten by both Burmans and Chins."

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(37) CALLOSCIURUS SLADENI SLADENI, And.

Sladen's Squirrel.

(Synonymy in No. 20.)

♂ 1, Kindat, 10m., N.-E.
♀ 1, Taweela Sakan, 30 miles S.-E. of Kindat.

This form extends, as we already know, unchanged to the Irrawaddy.

(38) CALLOSCIURUS SLADENI CAREYI, Thos. and Wr.

Carey's Squirrel.

(Synonymy in No. 20.)

♂ 1, Tamanthe.

(39) CALLOSCIURUS SLADENI HARINGTONI, Thos.

Harington's Squirrel.

(Synonymy in No. 20.)

♂ 1, ♀ 1, Maungkan, 165 miles N. of Kindat.

(40) CALLOSCUIRUS SLADENI MILLARDI, Thos. and Wr.

Millard's Squirrel.

(Synonymy in No. 20.)

♂ 2, Intha, 100 miles N. of Kindat.

The specimens of these forms are quite like those contained in the original collection from neighbouring localities.

(41) CALLOSCIURUS ERYTHRAEUS NAGARUM, Thos. and Wr.

The Naga Squirrel.

(Synonymy in No. 20.)

♂ 1, Kindat; ♀ 1, Kabaw Valley, 20m., W; ♂ 3, ♀ 3, Chin Hills 50-65m., W.

(42) CALLOSCIURUS ERYTHRAEUS KINNEARI, Thos. and Wr.

Kinnear's Squirrel.

(Synonymy in No. 20.)

♀ 3, Kindat, 6-20m., W; ♀ 1, Mawlaik, 8m., S; ♂ 1, Tamu, 40m., W.

(43) TOMEUTES MEARSI MEARSI, Bonh.

Mears' Squirrel.

(Synonymy in No. 20, under *T. lokroides mearsi*).

♂ 2, Setoo, 150.m., S of Kindat.

This is the first time *T. mearsi* proper has been taken since Col. Mears obtained it, more than 10 years ago. His specimens were taken in January, these are dated October, and still show the summer pelage, though it is evidently changing. Mr. Thomas and myself, in a joint paper, have dealt with this on an earlier page (Vol. XXIV., p. 419).

(44) TOMEUTES MEARSI VIRGO, Thos. and Wr.

The Upper Chindwin Squirrel.

1916. *Tomeutes mearsi virgo*, Thomas and Wroughton, Journ. B. N.H. S., Vol. XXIV., p. 421.

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♂ 13, ♀ 7, Kindat, up to 20m., W; ♂ 1, ♀ 1, skull only 1, Kabaw Valley; ♂ 1, Yuchung; ♂ 1, Letsigan; ♀ 1, in al. 3 (fœtus), Manipur; ♂ 3, Tamu; ♂ 2, in al, Chin Hills.

These are winter specimens of the form recorded in the Chindwin Report as *T. lokroides lokroides* (*vide* paper quoted above, under *T. mearsi mearsi*).

(45) DREMOMYS MACMILLANI, Thos. and Wr.

Macmillan's Squirrel.

♀ 5, Chin Hills, 50m., W.

(46) DREMOMYS PERNYI, M. Edw.

Perny's Squirrel.

1867. *Dremomys pernyi*, Milne-Edwards. Rev. Zool., p. 230.

♂ 2, ♀ 2, Chin Hills, 50-65m., W.

This is the first record of this Yunnan species within our limits.

(47) TAMIOPS MACCLELLANDI MANIPURENSIS, Bonh.

The Manipur Striped Squirrel.

(Synonymy in No. 20.)

♂ 1, Setoo, 30m., S.-E. of Kindat; ♂ 8, ♀ 5, in al. 1.. Chin Hills, 50-65m., W.

"Common in the Chin Hills, and is said to be seen occasionally in the Kabaw Valley. A very active little beast."—J.M.D.M.

(48) VANDELEURIA DUMETICOLA, Hodgs.

Hodgson's Tree Mouse.

(Synonymy in No. 16.)

In al. 2, Kindat, 25m., W; ♂ 1, Tamu, 20m., W; not sexed, no skull 1, Chin Sawchin; ♂ 3, ♀ 4, not sexed 2.. Chin Hills, 40-65m., W.

(49) MUS BOODUGA, Gray.

The Southern Field Mouse.

(Synonymy in No. 1.)

♂ 1, Kabaw Valley.

(*See* also all Reports except No. 3, 14, 17, 23, 24 and 26.)

(50) MUS COOKII, Ryl.

The Burma Field Mouse.

(Synonymy in No. 14.)

♂ 1, ♀ 1, in al. 1, Kindat, up to 20m., W; ♂ 4, ♀ 8, no sex 2, in al. 1, Chin Hills, 30-50m., W; in al. 1, Kabaw Valley. 20m., W; ♀ 1, Kabaw Valley.

(*See* also Report No. 20.)

(51) RATTUS RUFESCENS, Gray.

♂ 5, ♀ 9, in al. 3, Chin Hills, 50-65m., W; skull only 1, Yut Foo.

Variety with white underparts:—

♂ 4, ♀ 4, Kindat, up to 20m., W; ♂ 1, Chin Hills, 30m., W. ♂ 1 (juv.), Kabaw Valley.

Mr. Hinton, who is now studying our rats of the *rufescens* and allied groups, informs me that, so far as he can at present say, the dark bellied specimens above are more nearly related to *nitidus* than to *rufescens*.

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Should this prove to be really so, it will be a most interesting fact, for hitherto in these Reports I have adopted a working theory that the white bellied form is a truly wild form, while true *rufescen* is the result of parasitism on man, living in pucca houses, and therefore as *rufescens* it would be hard to account for their presence in the Chin Hills.

(53) RATTUS FULVESCENS, Gray.

The Chestnut Rat.

(Synonymy in No. 15.)

♂ 1, ♀ 1, Chin Hills, 50m., W.

(*See* also Report No. 23.)

(54) RATTUS MENTOSUS, Thos.

The Chin Rat.

1916. *Epimys mentosus*, Thomas, Journ., B. N. H. S., Vol. XXIV, p. 643.
♂ 1, Chin Hills, 50m., W.

This specimen is conspecific with Mr. Shortridge's series from Hkamti, which was classed in the Chindwin Report as *jerdoni*. Since then the name *jerdoni* has had to be abandoned (*vide* Sikkim Report), as a synonym of *fulvescens*, consequently another name has been provided by Mr. Thomas.

(55) RATTUS MANIPULUS, Thos.

The Manipur Rat.

1891. *Mus berdmorei*, Blanford, Mammalia, No. 277 (*partim.*)
1916. *Epimys manipulus*, Thomas, Journ., B. N. H. S., Vol. XXIV, p. 413.
♂ 14, ♀ 11, Kindat, up to 20m., S.-W.; ♀ 4, in al. Kabaw Valley, 20m., W; ♂ 11, ♀ 8, skulls only 4, Chin Hills, 50-65m., W.

"Fairly common in the jungle. I have never obtained it from the fields. The Chins say that, about February-March, 8 or 9 young ones are found with an old female (very rarely an old male) in a single hole; later they break up and pair. Old males are said to live alone except when paired."—J. M.D.M.

(56) RATTUS MACKENZIEI, Thos.

Mackenzie's Rat.

1891. *Mus bowersi*, Blanford, Mammalia, No. 276 (*partim*).
1916. *Epimys mackenziei*, Thomas, Journ., B. N. H. S., Vol. XXIV, p. 411.
Not sexed 2, Yut Pee; ♂ 8, ♀ 13, Chin Hills, 30-50m., W.

(52) RATTUS Sp.

No skull 1, Chin Hills, 50 m., W.

A flat skin with no skull, it is impossible to identify this rat.

(58) CANNOMYS BADIUS, Hodgs.

The Bay Bamboo Rat.

(Synonymy in No. 20.)

♂ 2, ♀ 4, skulls only 3, Kindat, up to 20 m., S.-W.; ♂ 2, ♀ 3, no skull 1, skulls only 3, Chin Hills, 50-65m., W.
♂ 1, Haingyan, Chin Hills; ♂ 2, Pwepi, Chin Hills; ♂ 1 (juv.), ♀ 3, Madan, Chin Hills.

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Mr. Thomas has recently sorted out the Genus *Cannomys* (A. M. N. H., Vol. XVI, p. 314). The following alterations are therefore required in past Reports, *viz*:—

No. 14. Shan States, for *R. castaneus* read *C. castaneus castaneus*.
No. 16. Mt. Popa, for *R. castaneus* read *C. pater*.

"A tunnel runs from heap to heap, about 2 below the surface until it turns down to the nest, and is usually produced, for a short distance, beyond the nest as a blind ally. A hole is always left in the heap, at the mouth of the tunnel, when the beast leaves its burrow, and is closed when it returns underground. This animal is slow on the surface of the ground, but it can and does bite badly. When attacked, it will always turn found to face its attacker, and make a hissing noise, with the mouth wide open; the gape is very wide; it can see, but not well."—J.M.D.M.

(59) MUNTIACUS GRANDICORNIS, Lyd.

The Tenasserim Rib-faced Deer.

(Synonymy in No. 17.)

♂ 1, Kabaw Valley, 20 m., W.; ♂ 1, ♀ 1, Kindat.

(*See* also Reports Nos. 14, 16 and 20.)

"I shot one with horns in velvet on July 23rd. I put up a female with a one-third grown calf in February."—J.M.D.M.

REPORT No. 26. DARJILING DISTRICT.

BY R. C. WROUGHTON.

COLLECTION	... ...	No. 26.
LOCALITY	... ...	Darjiling District.
DATE	... ...	June to August, 1915.
COLLECTED BY	... ...	N. A. Baptista.
EARLIER REPORTS...	...	No. 1, East Khandesh, Vol. XXI, p. 392, 1912; No. 2, Berars, Vol. XXI, p. 820, 1912; No. 3, Cutch, Vol. XXI, p. 826, 1912; No. 4, Nimar, Vol. XXI, p. 944, 1912; No. 5, Dharwar, Vol. XXI, p. 1170, 1912; No. 6, Kanara, Vol. XXII, p. 29, 1913; No. 7, Central Provinces, Vol. XXII, p. 45, 1913; No. 8, Bellary, Vol. XXII, p. 58, 1913; No. 9, Mysore, Vol. XXII, p. 283, 1913, No. 10, Kathiawar, Vol. XXII, p. 464, 1913; No. 11, Coorg, Vol. XXII, p. 486, 1913; No. 12, Palanpur, Vol. XXII, p. 684, 1913; No. 13, South Ceylon, Vol. XXII, p. 700, 1913; No. 14, Shan States, Vol. XXII, p. 710; No. 15, Kumaon, Vol. XXIII, p. 282, 1914; No. 16, Dry Zone, Central Burma and Mt. Popa, Vol. XXIII, p. 460, 1915; No. 17, Tennasserim, Vol. XXIII, p. 695, 1915; No. 18, Ceylon, Vol. XXIV, p. 79, 1915; No. 19, Bengal, Vol. XXIV, p. 96, 1915; No. 20, Chindwin, Vol. XXIV, p. 291, 1916; No. 21, Gwalior, Vol. XXIV, p. 309, 1916; No. 22, Koyna Valley, Vol. XXIV, p. 311, 1916; No. 23, Sikkim, Vol. XXIV, p. 468, 1916; No. 24, Sind, Vol. XXIV, p. 749, 1916; No. 25, Chin Hills, Vol. XXIV, p. 758, 1916.

When Mr. Crump, the Society's Mammal Survey Collector had to leave for Europe, to "do his bit", Baptista and the rest of the party

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proceeded to Gopaldhara where they worked for 7 weeks, under the supervision of Mr. Stevens. They then moved to Pashok where Mr. R. S. Lister controlled their work for nearly 17 weeks, up to the 12th of October, 1915.

The present collection is the result. It is in actual fact a supplement to the collection made in Sikkim by Mr. Crump. As both the centres of collection are in the Darjiling District I have adopted that name as the most suitable and convenient for this Report.

Gopaldhara is on the Nagri Ridge, almost on the Nepal Frontier, 17 miles west of Sonada Railway Station (D. H. Ry.), S.W. of Darjiling.

Mr. H. Stevens has kindly furnished the following notes :—

"*Gopaldhara.*—A tea garden situated in the extreme north-west corner of the Kurseong sub-division of the Darjiling district, on the eastern slopes of the Mirih-Simana Ridge, in the Rungbong valley and adjacent to the eastern frontier of the Native State of Nepal. This portion of the ridge runs almost due north and south and forms the watershed between the valleys of the Rungbong and Mechi Rivers which have their source hereabouts. The Mechi River rises at 6,000 feet, approximately on this ridge and in its course south is the natural dividing line between Nepal and British Sikkim. With the exception of the reserved timber land under the care of the Forest Department which lies along the lower foot hills and in general above 6,000 feet, the land in the intervening area is given over to tea cultivation, which has led in a great measure to the disappearance of the indigenous vegetation. The deforestation of the hill sides is even more marked in the surrounding country in Nepal where apparently no control has been exercised over the crude and destructive methods in vogue of the "paharia." What here remains of the primitive forest is confined to the steep gullies or "jhoras." A few proprietors with due foresight have realised that a proportion of forest land on the grant is a valuable asset apart from the fact of its utility from a commercial point of view, wooded country undoubtedly exerts an influence over the soil in its proximity in attracting local showers of rain. For our purpose they serve as a retreat for animal life. The Collection under consideration was obtained unless otherwise stated on this grant which fulfils all the requirements of a reserve and has a range in altitude from 3,440 feet at the Rungbong river level to 6,100 feet on the Nepal boundary, as it encloses a useful ratio of forest land as well as cleared land for maize growing under occupation by the garden labour and also well watered spare land planted with cardamoms; it no doubt supports a fauna fairly representative of this locality. The Collection is unfortunately deficient in many specimens of the larger mammals known to occur at these elevations, which fact is due to the limited time at our disposal and the usual difficulties to contend

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with in collecting at the commencement of the rainy season, amongst which the following species call for notice. Tiger are very seldom reported though plentiful in the Terai, and in the winter actually ascend to Saudakphu 11,923 feet (March 1912) from the wooded Sikkim side on a continuation north of the present frontier. Leopard are occasionally obtained including the melanistic variety which appears to be more a product of the hill regions than the plains. The other smaller *Felidæ* seldom come under observation unless it be the Jungle and Leopard cats, *Felis affinis* and *F. bengalensis* which are possibly more plentiful than usually supposed. The Himalayan Monkey, generally shy and difficult of approach, takes the opportunity along with small droves of wild pig whenever a chance offers of varying its ordinary jungle diet by pilfering the edible products of cultivation. Jackal are rarely obtrusive either by their presence or in their habits. Single individuals are met with more frequently than packs; they also ascend to high altitudes in the cold weather months Phalut, 11,811 feet (February 1912), Nepal-Sikkim frontier. Serow, locally known as Thar, at this period descend from higher ground though few are actually obtained. Barking Deer are plentiful and several cases have come to my notice of the toll taken of their young by Martens, *Martes flavigula*, which latter do a considerable amount of damage amongst ground dwelling birds. Black Bear, *Ursus torquatus*, occasionally wander from their lairs and leave their accustomed haunts in the forest. Porcupine are frequently disturbed from their abode in dense undergrowth on the steep and rocky ground. The habits of the Palm Civet more often than not denotes its presence than its actual appearance. The Tree Shrew (*Tupaia*) which occurs in the lower foot hills with a decided superficial resemblance to the squirrel *Tomeutes lokroides* is absent but the Mole is a common resident, though lower elevations seem not suited to its requirements. The Himalayan Weasel, *Mustela subhemachalana* is to be found, and a Stoat* of higher altitudes may possibly prove a new species to science. Hares manage to retain their status in some numbers and at all events reach the outer precincts of the cleared ground above 6,000 feet. Different species of Squirrel are few. Small Bats commonly occur but so far there is no reliable information of the appearance of Flying foxes. First hand evidence of the presence of otters in the rapid water and stony beds of the rivers is also lacking.

The average rainfall taken over a period of seven years at the bungalow elevation of 4,720 feet gives a measurement of 107-8 inches, most of which falls during the four months June to September. In comparison the ridge on which Kurseong stands the head

* Kalapokri Camp, 10,000′, Nepal Sikkim Frontier (March 1912). One was brought in alive which unfortunately bit the youth and made its escape. Blanford makes no mention of a Stoat in East Nepal.

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quarters of the sub-division has a rainfall of 153·8" (average 1906-15) at a similar elevation 8 miles distant as the crow flies nearer the plains which receives the full force of the south-west monsoon."

The following is extracted from a note by Mr. Lister:—

"*Pashok* is 17 miles E. N. E. from Darjiling, about 88¼ E. Long. and 27 N. Lat. on a spur of the outer Himalaya, branching from the Senchal Range at Goom, and running out to the junction of the Great Runjeet and Teesta Rivers, it has a range of elevation of from 900 to 1,000 feet above sea-level. The average rainfall for the past 20 years is 66 inches. It is probably the driest ridge in the Darjiling District. Pashok in the Lepcha language means 'Forest.' The forest here comprises Magnolia, Oak, Walnut, Chestnut, Toon, Figs, Bombax and Sal. Bamboos grow luxuriantly below 3,000 feet. The rock is Gneiss, varying from a foliated, granatoid rock, composed of quarts, felspar, and biotite, to a more or less pure mica-schist." I may remark that Pashok is marked on the map published with the Sikkim Report.

As was to be expected the bulk of the specimens are of the same species as some of those recorded in the Sikkim Report, but quite a number of bat species new to the Survey were obtained especially at Tong Song. The outstanding feature however of the Collection is the new Genus and Species *Dacnomys millardi*, "caught in the maize fields at about 4,000 feet elevation" and brought in for rewards by Mr. Lister's coolies; a specimen was also taken at Gopaldhara also the new giant rat, *Rattus listeri*, taken at Pashok. It is amazing that such huge rats never crossed the path of earlier collectors in these parts, of whom there have been so many.

The hearty thanks of the Society are due to Messrs. R. S. Lister and H. Stevens for their public spirited adoption of the responsibilities of the Survey, and the very thorough way they must have worked in order to obtain such fine results.

The Collection contains 954 specimens (including 6 which are not determinable, representing 46 species and subspecies, distributed among 31 Genera.

(1) MACACA RHESUS, Audeb.

The Bengal Monkey.

(Synonymy in No. 7).

♂ 2, Pashok.

(*See* also Reports Nos. 14, 15, 19 and 23.)

(2) MACACA PELOPS, Hodgs.

The Nepal Monkey.

(Synonymy in No. 23.)

♂ 1, Pashok.

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(3) CYNOPTERUS SPHINX, Vahl.

The Southern Short-nosed Bat.

(Synonymy in No. 6.)

♂ 1, ♀ 1, Tong Song; ♀ 2, Pashok.

(*See* also Reports Nos. 9, 11, 13, 14, 15, 18, 19, 20, 23 and 25.)

(4) RHINOLOPHUS PEARSONI, Horsf.

Pearson's Horse-shoe Bat.

(Synonymy in No. 15.)

♂ 4, ♀ 1, in al. 2, Pashok.

(5) RHINOLOPHUS AFFINIS, Horsf.

The Allied Horse-shoe Bat.

(Synonymy in No. 20.)

♂ 1, ♀ 1, Pashok.

(6) HIPPOSIDEROS ARMIGER, Hodgs.

The Great Himalayan Leaf-nosed Bat.

(Synonymy in No. 14.)

♂ 2, ♀ 2, Gopaldhara; ♂ 7, ♀ 6, Tong Song; ♂ 10, ♀ 18, Pashok.

(*See* also Reports Nos. 15, 16, 20 and 25).

(7) HIPPOSIDEROS FULVUS, Gray.

The Bicoloured Leaf-nosed Bat.

(Synonymy in No. 3.)

♂ 11, ♀ 14, Pashok.

(*See* also Reports Nos. 5, 6, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, 22 and 23.)

(8) BARBASTELLA DARJELINGENSIS, Horsf.

The Eastern Barbastel.

1855. *Plecotus darjelingensis*, Horsfield, A. M. N. H. (2) XVI, p. 103.
1891. *Synotus darjelingensis*, Blanford, Mammalia, No. 172.
in al. 1, Tong Song.

(9) NYCTALUS LABIATUS, Hodgs.

The Indian Noctule Bat.

(Synonymy in No. 25.)

in al. 1, Tong Song.

(10) PIPISTRELLUS MORDAX, Pet.

The Grizzled Bat.

1866. *Vesperugo mordax*, Peters, M. B. Akad. Berl., p. 402.
1891. *Vesperugo mordax*, Blanford, Mammalia, No. 183.
♂ 1, Gopaldhara.

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(11) PIPISTRELLUS BABU, Thos.

The Babu Pipistrel.

1915. *Pipistrellus babu*, Thomas, Journ., B.N.H.S., Vol. XXIV, p. 30.
♂ 2, ♀ 1, in al. 1, Pashok.

(12) PIPISTRELLUS CADORNÆ, Thos.

Cadorna's Pipistrel.

1916. *Pipistrellus cadornæ*, Thomas, Journ., B.N.H.S., Vol. XXIV, p. 415.
♂ 1, Pashok.

(13) PIPISTRELLUS COROMANDRA, Gray.

The Coromandel Pipistrel.

(Synonymy in No. 5.)

♂ 1, ♀ 2, Gopaldhara; ♂ 7, ♀ 2, Pashok.

(*See* also Reports Nos. 9, 11, 13, 14, 15, 19 and 23.)

(14) TYLONYCTERIS FULVIDA, Blyth.

The Club-footed Bat.

1859. *Scotophilus fulvidus*, Blyth, J. A. S. B., XXVIII, p. 293.
♂ 19, ♀ 34, Pashok.

Recently an attempt was made to assign these bats to several existing species, but the present long series shows that the result was not a success. Mr. Thomas agrees with me that the safest way is to apply the name *fulvida* to all specimens taken within our area, excepting only *aurea* from the West Coast.

(15) SCOTOMANES ORNATUS, Blyth.

The Harlequin Bat.

(Synonymy in No. 23.)

♂ 1, Tong Song, ♂ 2, Pashok.

(16) MURINA TUBINARIS, Scully.

Scully's Tube-nosed Bat.

(Synonymy in No. 25.)

♀ 1, Gopaldhara; in al. 1, Tong Song.

(17) MURINA CYCLOTIS, Dobs.

The Round-eared Tube-nosed Bat.

(Synonymy in No. 23.)

♂ 2, Gopaldhara; ♂ 3, ♀ 2, Pashok.

(18) MURINA RUBEX, Thos

The Rufous Tube-nosed Bat.

1916. *Murina rubex*, Thomas, Journ., B. N. H. S., Vol. XXIV, p. 639.
♀ 1, Pashok.

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(19) HARPIOCEPHALUS LASYURUS, Hodgs.

The Hairy-tailed Bat.

1847. *Noctilinia lasyura*, Hodgson, J. A. S. B., XVI, p. 896.
1881. *Lasiurus pearsonii*, Horsfield, Cat., p. 36.
1891. *Harpyiocephalus harpyia*, Blanford, Mammalia, No. 200.
in al. 1, Tong Song.

(20) KERIVOULA HARDWICKEI, Horsf.

Hardwicke's Bat.

1824. *Vespertilio hardwickii*, Horsfield, Res. Jav.
1871. *Kerivoula fusca*, Dobson, P.A.S.B.,p.215
1891. *Cerivoula hardwickii*, Blanford, Mammalia, No. 214.
♀ 3, Gopaldhara; ♀ 2, Pashok; in al. 2, Tong Song.

Resembling *K. crypta*, Wr., described in an earlier number of this Journal (Vol. XXII, p. 14), but rather larger and rather paler.

(21) MYOTIS SICARIUS, Thos.

The Sikkim Myotis.

1915. *Myotis sicarius*, Thomas, Journ. B. N. H. S., Vol. XXIII, p. 608.
♂ 3, Pashok.

Mr. Thomas has furnished me with the following note:—"This species was only recently described, from an imperfect specimen, from Sikkim, presented by Mr. Blanford, and collected by Mandelli. These two excellent specimens are therefore most acceptable.

The complete skull dimensions could not be given, and those of No. 391, a fully adult male, may therefore be useful.

Greatest length, 18·4; basi-sinual length, 14·5; zygomatic breadth, 12·5; interorbital breadth, 4·6; breadth of braincase, 8·8; palato-sinual length, 8; front of canine to back of m^3, 7·6; front of p^4 to back of m^2, 5; breadth across outer corner of m^2, 8·2.

No. 500 is somewhat markedly smaller, with smaller canines and is probably a female."

(22) TALPA MICRURA, Hodgs.

The Short-tailed Mole.

(Synonymy in No. 23.)

♂ 7, ♀ 25, Gopaldhara; ♂ 2, ♀ 2, Tong Song; ♂ 1, ♀ 1, Songma; ♀ 1, Pashok.

(23) PACHYURA sp.

The Musk Rat.

♂ 2, ♀ 4, Gopaldhara; ♂ 28, ♀ 20, Pashok.

(24) PACHYURA HODGSONI, Blyth.

The Himalayan Pigmy Shrew.

(Synonymy in No. 15.)

♂ 1, ♀ 2, Pashok.

I find that in the Synonymy in No. 15, I have ascribed the name *hodgsoni* to Jerdon, overlooking the earlier use of it by Blyth (J. A. S. B. XXIV, p. 33, 1855).

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(25) SORICULUS CAUDATUS, Horsf.

Hodgson's Brown-toothed Shrew.

(Synonymy in No. 15.)

♂ 2, Gopaldhara; ♂ 1, ♀ 1, Songma; ♂ 28, ♀ 14, Pashok.

(*See* also Report No. 23.)

(26) SORICULUS NIGRESCENS, Gray.

The Sikkim Brown-toothed Shrew.

(Synonymy in No. 15.)

♂ 1, ♀ 1, Gopaldhara; ♂ 3, ♀ 6, Pashok.

(*See* also Report No. 23.)

(27) NECTOGALE SIKHIMENSIS, de Wint.

The Thibetan Water Shrew.

(Synonymy in No. 23.)

♂, Tong Song; ♀ 1, Pashok.

(28) VIVERRA ZIBETHA, L.

The Large Indian Civet.

(Synonymy in No. 20.)

♂ 1, ♀ 1, Gopaldhara; ♀ 1, Songma; ♂ 2, ♀ 1, Pashok.

(29) MUSTELA KATHIAH, Hodgs.

The Yellow-bellied Weasel.

(Synonymy in No. 15.)

♀ 1, Pashok.

(30) PTEROMYS (HYLOPETES) ALBONIGER, Hodgs.

The Particoloured Flying Squirrel.

(Synonymy in No. 20.)

♂ 1, ♀ 2, Pashok; ♀ 1, Ambootia.

(*See* also Reports Nos. 23 and 25.)

(31) RATUFA GIGANTEA, Mc.Cl.

The Assam Giant Squirrel.

(Synonymy in No. 14.)

♀ 1, Pashok.

(*See* also Report No. 23.)

(32) TOMEUTES LOKROIDES, Hodgs.

The Hoary-bellied Himalayan Squirrel.

(Synonymy in No. 23.)

♂ 4, Gopaldhara; ♂ 1, ♀ 4, Pashok; ♂ 2, Tong Song.

Half of these represent the old species *similis*. The question of seasonal pelage in these squirrels has been dealt with in the last Report and elsewhere in this Journal.

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(33) DREMOMYS LOKRIAH, Hodgs.

The Orange-bellied Himalayan Squirrel.

(Synonymy in No. 20.)

♂ 2, Pashok.

(*See* also Report No. 23.)

(34) TAMIOPS MACCLELLANDI, Hodgs.

The Himalayan Striped Squirrel.

(Synonymy in No. 20.)

♂ 1, ♀ 1, Gopaldhara.

(35) VANDELEURIA DUMETICOLA, Hodgs.

Hodgson's Tree Mouse.

(Synonymy in No. 16.)

♂ 3, ♀ 3, Pashok.

(*See* also Reports Nos. 23 and 25.)

(36) MUS PAHARI, Thos.

The Sikkim Hill Mouse.

(Synonymy in No. 23.)

♂ 12, ♀ 12, Pashok.

(37) MUS DUBIUS, Hodgs.

The Nepal House Mouse.

(Synonymy in No. 15.)

♂ 2, ♀ 3, Gopaldhara; ♂ 4, ♀ 2, Tong Song; ♂ 1, ♀ 1, Songma; ♂ 41, ♀ 40, Pashok.

(*See* also Report No. 23.)

(38) MUS HOMOURUS, Hodgs.

The Himalayan House Mouse.

(Synonymy in No. 15.)

♂ 12, ♀ 1, Gopaldhara; ♂ 3, ♀ 1, Songma; ♂ 24, ♀ 10, Pashok.

(*See* also Report No. 23.)

(39) RATTUS RUFESCENS, Gray.

The Common Indian Rat.

Variety with white underparts:—

♂ 9, ♀ 9, Gopaldhara; ♂ 2, ♀ 1, Songma; ♂ 68, ♀ 79, Pashok.

Mr. Hollister of the Washington Museum has recently (P. Biol. Soc. Wash, XXIX. p. 126, 1916.) pointed out that the name *Rattus* was employed for the rats in 1803, thus antedating, by very many years the Generic name *Epimys* instituted by Trouessart in 1881. The necessity for this change is regrettable, but as it has to be accepted it is fortunate that the revised name is a better one than *Epimys*.

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(40) RATTUS NITIDUS, Hodgs.

Hodgson Grey-bellied Rat.

(Synonymy in No. 15.)

♂27, ♀20, Gopaldhara; ♀2, Tong Song; ♂24, ♀17, Pashok.

(*See* also Report No. 23.)

(41) RATTUS FULVESCENS, Gray.

The Chestnut Rat.

(Synonymy in No. 15.)

♂2, ♀1, Gopaldhara; ♀1, Songma; ♂54, ♀45, Pashok.

(*See* also Reports Nos. 23 and 25.)

(42) RATTUS LISTERI, Thos.

The Sikkim Giant Rat.

1916. *Epimys listeri*, Thomas, Journ. B. N. H. S., Vol. XXIV., p. 407.
♂2, Pashok.

This is the most western form of this group of Giant Rats with white tail tips of which we have lately received *mackenziei* from the Chin Hills. It is indicated in Blanford's Mammalia by the name *bowersi*.

(43) DACNOMYS MILLARDI, Thos.

The Large-toothed Giant Rat.

1916. *Dacnomys millardi*, Thomas. Journ. B. N. H. S., Vol. XXIV., p. 404.
♀1, Gopaldhara; ♀1, Pashok.

A new Genus had to be established to contain this striking new animal, whose closest affinities seem to be with a small group of genera found in and round Borneo.

(44) GUNOMYS BENGALENSIS, Gr. & Hardw.

The Bengal Mole Rat.

(Synonymy in No. 19.)

♂16, ♀17, Pashok.

(*See* also Reports Nos. 20 and 23.)

(45) CANNOMYS BADIUS, Hodgs.

The Bay Bamboo Rat.

(Synonymy in No. 20.)

Not sexed 1, Narbong.

(*See* also Reports Nos. 23 and 25.)

(46) LEPUS RUFICAUDATUS, Geoff.

The Common Bengal Hare.

(Synonymy in No. 15.)

♀1, juv. Gopaldhara.

(*See* also Reports Nos. 19, 21 and 23.)

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A LIST OF THE NATURAL ORDERS AND GENERA OF BOMBAY PLANTS WITH DERIVATIONS OF THE NAMES.

BY

H. M. CHIBBER, M.A.,

Assistant Professor of Botany, Agricultural College, Poona.

PART III.

(*Continued from page 467 of this Volume.*)

GENUS AND AUTHOR.	NATURAL ORDER.	DATE.	DERIVATION AND COMMON NAME.
RADERMACHERA, Zoll. and Mor.	Bignon.	..	Commemorative.
RANDIA, (Houst.) L.	.. Rubia.	1737..	after Isaac RAND of the Botanic gardens at Chelsea.—N.
RANUNCULUS, (Tourn.) L.	Ranun.	1735..	a diminutive of *rana*, a frog, because of the marshy habitat of many plants of this genus. *Buttercup.*
Rapanea, Aubl.	.. Myrsin.	1775..	
Raphanus, (Tourn.) L.	.. Crucifer.	1735..	an ancient name. *Radish.*
RAUWOLFIA, (Plum.) L.	Apocyn.	1737..	after Leonhard RAUWOLF, physician at Augsburg, who travelled through Palastine in 1753-55.—N.
Ravenala, Adans.	.. Scitamin.	1763..	said to be its native name in Madagascar.—N. *Traveller's-tree.*
Ravenia, Vell.	.. Ruta.	1827..	not explained by the author.—N.
Reinwardlia, Dmrt.	.. Lin.	..	after K. G. K. REINWARDT, 1773-1822 Director of the Botanic Gardens at Leyden.—N.
REINWARDTIA, Dmrt.†.	Lin.	1822..	do. do.
REMIREA, Aubl.	.. Cyper.	1775..	its name in Guiana.
REMUSATIA, Schott.†	.. Araceæ.	1832..	after Abel REMUSAT, 1785-1832, an orientalist.—N.
Renanthera, Lour.	.. Orchid.	1790..	*ren anthera*; the anthers are kidney-shaped.—N.
RESEDA, (Tourn.) L.†	.. Reseda.	1735..	*resedo*, to calm; a medicinal name.—N. *Mignonette.*
RHABDIA, Mart.	.. Borag.	1827..	from *rhabdos*, a twig; a shrub with twiggy branches.
RHAMNUS, (Tourn.) L.	.. Rhamna.	1735..	from Celtic *ram*, a tuft of branches.—*Buckthorn.*
RHAMPHICARPA, Benth.	Scroph.	1835..	from *rhamphos*, a beak, and *karpos*, fruit; the capsule is beaked.
Rhaphidophora, Hassk.	Araceæ.	1842..	from *rhaphis*, a needle, and *phoros* bearing.
RHAZYA, Dcne.	.. Apocyn.	1835..	from the Arabic name.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name
Rheum, L.	Polygon.	1735	from *Rha*, its Greek name.—N. *Rhubarb.*
Rhinacanthus, Nees.†	Acanth.	1832	from *rhinos*, the nose. *Ringworm-root.*
Rhizophora, L.	Rhizophor	1737	from *rhiza*, and *phoros*; the root tangle is very conspicuous. *Mangrove.*
Rhodanthe, Lindl.	Compo.	1834	from *rhodon*, a rose, and *anthemon*, a flower.
Rhœo, Hance.	Commel.	1853	not explained by its author.—N.
Rhus, (Tourn.) L.	Anacard.	1737	after its old Greek name. –N.
Rhynchocarpa, Schrad.	Cucurbit.	1838	the fruit is usually rostrate; Syn. of *Kedrostis* Medik.
Rhynchoglossum, Bl.	Gesner.	1826	meaning beaked tongue; the allusion is not understood.
Rhynchosia, Lour.	Leg. Papil.	1790	*rhynchos*; alluding to the shape of the keel.—N.
Rhynchospora, Vahl.*	Cyper.	1809	from *rhynchos* and *sporos*.
Rhynchostylis, Bl.	Orchid.	1825	the column is beaked.—N.
Ricinus, (Tourn.) L.	Euphor.	1735	meaning a tick; the seeds suggested the comparison.—N. *Castor-oil Plant.*
Riedleia, DC. ‡	Stercul.	1824	Commemorative.
Rivea, Choisy	Convol.	1833	in honour of Auguste de la Rive, a physiologist of Geneva.—N.
Rivina, (Plum.) L.	Phytolac.	1735	after A. Q. Rivinus, 1652-1722, Professor of Botany and Medicine at Leipsic.—N. *Blood-berry.*
Rondeletia, L.	Rubia.	1737	after William Rondelet, 1507-1566, a scientific physician.—N.
Rosa, (Tourn.) L.	Rosa.	1735	the old Latin name.—N. *Rose.*
Rosmarinus (Tourn.) L.	Lab.	1735	from *ros*, dew, and *marinus*, of the sea.—N. *Rosemary.*
Rostellaria, Nees	Acanth.	1832	*rostellum*, a little back.
Rostellularia, Rchb.	Acanth.	1837	from *rostellum*, a little beak; the anthers carry the beak.
Rotala, L.	Lythr.	1771	*rota*, a wheel.
Rothia, Pers.	Leg. Papil.	1807	Commemorative.
Rottbœllia, L. f.	Gram.	1779	after C. F. Rottbœll, 1727-1797, a Danish botanist.—N.
Rottlera, Roxb.	Euphor.	1798	Commemorative.
Roupellia, Wall. and Hook.	Apocyn.	1849	from *roupell*, good smell (Drury); in honour of Roupell family encouragers of Botany.—N. *Cream fruit.*
Rourea, Aubl.	Connar.	1775	probably a native name of Guiana.—N.
Rubia, (Tourn.) L.	Rubia.	1735	*ruber*, red (dye).—N.
Rubus, (Tourn.) L.†	Rosa.	1735	the Roman name, kindred with *ruber*, red.—N. *Raspberry.*

* Rhynchospora, Willd, in Index Kewensis.
‡ Riedleia Vent. in Engler-Prantl.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Rudbeckia, L.	.. Compo.	1735..	after Olaf Rudbec, Professor of Botany at Upsal—N.
Ruellia, (Plum.) L. †	. Acanth.	1735..	in honour of John Ruelle of Soissons, 1474-1537, Botanist to Francis I.—N.
Rumex, L. †	.. Polygon.	1735..	a name applied by Pliny to the Sorrel-plant. *Dock.*
Rungia, Nees.	.. Acanth.	1832..	after F. F. Runge, born 1795.—Z.
Ruppia, L.	.. Naiad.	1735..	after N. B. Ruppius, a botanist.—N.
Ruscus, L.	.. Lil.	..	the berries are *red.*—N. *Butcher's broom.*
Russelia, Jacq.	.. Scroph.	1760..	After Alexander Russel, author of a natural History of Aleppo. 1756.—N.
Ruta, (Tourn.) L.†	.. Ruta.	1735..	probably from *ruomai*, to preserve.—N.
Sabal, Adans.	.. Palm.	1763..	said to be a native name in South America.—N. *Palmetto Palm and Savannah Palm.*
Saccharum, L.†	.. Gram.	1737..	from the Latin term for Sugar. *Sugar-cane.*
Saccolabium, Bl.	.. Orchid.	1825..	from *saccus*, and *labi*; the lip is sac-like.
Saccopetalum, Bennett.	Anona.	1838..	petals sac-like.
Sagaræa, Dalz.	.. Anona.	1851..	
Sageretia, Brongn.	.. Rhamna.	1827..	after M. Sageret, a French agriculturist.—N.
Sagittaria, (Rupp.) L.	Alis.	1735..	from *sagitta*, an arrow; a name after the shape of the leaves. *Water-archer.*
Saintpaulia, Wendl.	.. Gesner.	..	after Baron Von St. Paul, its discoverer. *Transvaal-violet.*—B.
Salacia, L.	.. Celastr.	1771..	after Salacia, wife of Neptune.—N.
Salicornia, (Tourn.) L.	Chenopod.	1737..	*sal*, salt, and *cornu*, a horn; saline habitat and bare horn-like branches probably referred to.—N.
Salix, (Tourn.) L.†	.. Sali.	1735..	from Celtic *sal*, near, and *lis* water; a habitat name.—D.
Salmalia, Schott.	.. Malva.	1832..	the old Latin name used by Virgil.—N.
Salomonia, Lour.*	.. Polygal.	1790..	after Solomon, King of Hebrews.—N.
Salpiglossis, R. & P.	.. Solan.	1794..	from *salpinx*, a tube, and *glossis*, a tongue; in allusion to the tongue like style in the mouth of the corolla.—N.

* Mentioned by Nairne in the Flowering Plants of Western India.

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Salsola, L.	Chenopod.	1735	a diminutive of *salsus*, salted; a habitat name.—N. *Alicant-soda.*
Salvadora, (Garcin.) L.	Salvador.	1751	after J. Salvador, a Spanish botanist. *Mustard-tree or Kiknel oil-plant.*
Salvia, (Tourn.) L.†	Labiat.	1735	from *salvio*, to save; in allusion to the healing qualities of the *sage*.—N.
Samadera, Gärtn.	Simarubi.	1791	
Samara, Sw.	Myrsin.	1788	the fruit is not a samara in the Bombay species.
Sanchezia, R. & P.	Acanth.	1794	in honour of Joseph Sanchez, Professor of Botany at Cadiz.—N.
Sansevieria, Thunb.	Hæmodor.	1794	in honour of M. Sansevier, a Swedish botanist (D.): after Raimond de Sanogrio, Prince of Sanseviero, 1710-1776.—N. *Bow-string-hemp.*
Santalum, L.†	Santal.	1742	from Persian *sandal*. *Sandal-wood tree.*
Santia, W. & A.	Rubia.	1834	
Sanvitalia, La Mark.	Compo.	1792	after the Parma family of Sanvitali.—N.
Sapindus, (Tourn.) L.†	Sapind.	1737	from *sapo* and *indicus*; an Indian substitute for soap. *Soap-nut tree.*
Sapium, P. Br.	Euphor.	1756	an old Latin name.—N. *Chinese Tallow-tree.*
Saponaria, L.	Caryophyll.	1735	from *sapo*: the leaves form a lather.—N. *Soapwort.*
Sapota, Plum.	Sapot.	1752	an ancient name.—N.
Saprosma, Bl.	Rubia.	1826	*sapros*, putrid, *osme*, smell.
Saraca, L.†	Leg. Cæs.	1767	after an American name.—N. *Ashoka.*
Sarcanthus, Lindl.†	Orchid.	1821	from *sarx*, and *anthos*; meaning fleshy flowers; perhaps a misnomer.
Sarcocephalus, Afz.	Rubia.	1818	alluding to the fleshy heads of the fruits.—N.
Sarcochilus, R. Br.†	Orchid.	1810	the middle lobe of the lip is fleshy.
Sarcoclinium, Wight	Euphor.	1887-88	from *sarx*, flesh, and *kline*, a couch; the disk is fleshy.
Sarcostemma, R. Br.	Asclep.	1809	from *sarx* and *stemma*, referring to the fleshy corona.
Sarcostigma, W. & A.	Ola.	1853	after the stigma, which is large and subsessile.
Satureia, L.	Lab.	1737	the old Latin name used by Pliny.—N.
Sauromatum, Schott.†	Araceæ.	1832	*saura*, a lizard; the interior of the spathe is speckled.—N.

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Sauropus, Bl.	Euphor.	1825	*sauros*, and *pous*; the author does not explain the name.—N.
Saxifraga, (Tourn.) L.	Saxi.	1737	it was supposed to break stones in bladder.—N.
Scabiosa, (Tourn.) L.	Dipsa.	1735	from *scabies*, the itch; a medicinal name.—N.
Scævola, L.†	Gooden.	1771	from *scæva*, the left hand; with reference to the oblique corolla.—N. *Malay Rice paper-plant.*
Scepa, Lindl.	Euphor.	1836	from *skepe*, a covering; referring to the stipules which cover the buds.—Z.
Schœnus, Gouan.	Cyper.	1765	
Schembra	Ampel.		
Schinus, L.	Anacard.	1737	the old Greek name by Theophrastus.—N.
Schismatoglottis, Zoll and Mor.	Araceæ.	1854	*schismatos glotta*, deciduous tongue; the limb of the spathe is deciduous.—N.
Schizanthus, R. and P.	Solan.	1794	from *schizo* and anthos; the corolla is incised.
Schizolobium, Vog.	Leg. Cæs.	1837	*schizo*, *lobos*; splitting (one seeded) pods.—N.
Schleichera, Willd.	Sapind.	1805	commemorative.
Schmidelia, L.	Sapind.	1767	after C. C. Schmidel, 1718-1792, Professor of Botany at Erlangen.—N.
Schotia, Jacq.	Leg. Cæs.	1786	in honour of Richard Van der Schot died in 1819.—N.
Schrebera, Roxb.	Olea.	1798	in honour of J. C. Schreber, a botanist.
Schweinfurthia, A. Braun.	Scroph.	1866	after Schweinfurth.
Scilla, L.	Lil.	1735	the old Greek name used by Hippocrates.—N. *Squill.*
Scindapsus, Schott.	Araceæ.	1832	from an old Greek name.—N.
Scirpus, (Tourn.) L.	Cyper.	1735	from the Celtic *cirs*, rushes (Drury); the old Latin name used by Pliny.—N.
Scleria, Berg.	Cyper.	1765	from *sklera* hardness; the fruit is indurated.—N.
Sclerocarpus, Jacq.	Compo.	1782	from *skleros* and *karpos*; refers to the roughness of the fruits.—N.
Scleropyron, Arn.*	Santal.	1838	the fruit is a drupe.
Sclerostylis, Bl.	Ruta.	1825	the style is stout and somewhat clavate in *S. Atalantiodes*.
Scolopia, Schreb.	Bixa.	1789	from *skolopos*, a thorn; trees with axillary spines.—Z.
Scoparia, L.	Scroph.	1748	*scopa*, a broom; the plant could be so used.—N.

* Scleropyrum in Cooke and Index Kewensis.

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Scorzonera, (Tourn.) L.	Compo.	1735..	from *scorzon*, a serpant; a medicinal term.—N.
Scutellaria, (Riv.) L.†	Labiat.	1735..	from *scutella*, a little saucer; the calyx is referred to.—N.
Scutia, Comm.	Rhamn.	1827..	from *scutum*, a shield; the disk fills the calyx tube.
Sebæa, Soland. *	Gentian.	1810..	after Albert Sebâ, 1665-1736, a botanist of Amsterdam.—N.
Sebastiania, ‡ Spreng.	Euphor.	1821..	commemorative.
Sechium, P. Br.	Cucur.	1756..	said to be derived from *sekos*, a pen or fold; the fruits are used to fatten the hogs.—N.
Securinega (Comm.) Juss.	Euphor.	1789..	from *securis*, an axe, and *nego*, to refuse; the wood is so hard.—N.
Seddera, Hochst.	Convol.	1844..	commemorative.
Sedum (Tourn.) L.	Crass.	1735..	*sedeo*, to sit; the plants appear seated on rocks.—N. *Live for ever.*
Seetzenia, R. Br.	Zygophyll.	1826..	after Ulrich Kaspar Seetzen, 1775-1811, a botanist and traveller in Syria, Arabia, &c.—Z.
Semecarpus, L. f. †	Anacard.	1781..	from *semion*, a mark and *karpos*; the marking fruit.—N. *Marking-nut Tree.*
Senebiera, DC. **	Crucifer.	1799..	commemorative.
Senecio (Tourn.) L.	Compo.	1735..	from *senex*, an old man; in allusion to the bald receptacle (D.); in allusion to the white hair-like pappus.—N.
Senna, Mill. §	Leg. Cæsal.	1768..	Arabic *senna*, acute, from its sharp pointed leaves.—N.
Senra, Cav.	Malva.	1786..	
Sericostoma, Stocks.	Borag.	1848..	*serikos*, silken, and *stoma*, mouth; the corolla mouth is such.—N.
Serissa, Comm.	Rubia.	1789..	a name altered from the old Greek *seris* used by Diocorides.—N.
Serpicula, L.	Halorag.	1767..	*serpo*, to creep; a creeper.
Serratula, (Dill.) L.	Compo.	1735..	*serrula*, a little saw, the leaves are serrate.—N.
Sesamum, L. †	Pedal.	1737..	from *sempsen* an Egyptian plant, (Drury). *Gingelly.*
Sesbania, Scop. † ‡‡	Leg. Papil.	1777..	from Arabic *Sesban*.—N. *Sesban.*
Sesuvium, L.	Ficoid.	1759..	Signification not known, probably arbitrary.—N. *Sea Purslane.*
Setaria, P. B. †	Gram.	1807..	*seta*, a bristle; alluding to the involucre of bristles.—N.

* Sebæa R. Br. in Durand and Engler-Prantl.
‡ Cooke gives Sebastiana, a misprint.
** Senebiera, Poir. in Cooke. Engler-Prantl. and Durand.
§ Senna, Wilde in Engler-Prantl.
‡‡ Sesbania, Pers. in Durand and Engler-Prantl.

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Shorea, Roxb.	.. Diptero.	1805..	after Sir John Shore?
Shutereia, Choisy.	.. Convol.	1833..	commemorative; see the next name.
Shuteria, W. & A.	.. Leg. Papil.	1834..	in honour of D. Shuter, Medical Officer, Madras Presidency, at the end of eighteenth century. —C.
Sida, L.	.. Malva.	1735..	an old Greek name used by Theophrastus for the Water Lily.—N. *Indian mallow.*
Siderroxylon, (Dill.) L.	Sapot.	1735..	from *sideros*, and *xylon*, because of the iron like hard timber.
Siegesbeckia, L.	.. Compo.	1737..	named after John George Siegesbeck, a German botanist.—N.
Silene, L. †	.. Caryophyll.	1735..	said to be from *sialon*, saliva; alluding to the viscid exudation on the stems and calyces; *cf.* the English name Catchfly.—N.
Sinningia, Nees.	.. Gesner.	1825..	after William Sinning, gardener to the University of Bonn.—N.
Siphonacanthus, Nees...	Acanth.	1847..	from *siphon*, and *acanthus*; tubular spines.
Slevogtia, Rchb.	.. Gentian.	1828..	in honour of a botanist, J. H. Slevogt.
Smilax, (Tourn.) L.†	.. Lil.	1735..	from *smile*, a scraper; in allusion to the prickly stems.—(D). *American China-root or Catbriar.*
Smithia, Ait.	.. Leg. Papil.	1789..	after Sir James Edward Swith, 1759-1828, founder of the Linnean Society.—N.
Sodada, Forsk.	.. Capparid.	1775..	
Solandra, Sw.	.. Solan.	1787..	after Daniel Charles Solander, 1736-1782, a Swedish botanist. —N.
Solanum, (Tourn.) L.†	Solan.	1735..	a name used by Pliny.—N. *Potato and Bringel.*
Solenocarpus, W. & A.	Anacard.	1834..	from *solen*, a tube and *karpos*; furrowed fruits; not so in the Bombay species.
Solidago, (Vaill.) L.	.. Compo.	1735..	*solido*, to join; a medicinal term. —N. *Golden-rod.*
Sonchus, (Tourn.) L.	Compo.	1735..	from its Greek name *Sonchos*.— *Sowthistle.*
Sonerila, Roxb.	.. Melastom.	1814..	from its native name in Khassia. —N.
Sonneratia, L. f.	.. Lythr.	1781..	after Pierre Sonnerat, 1749-1814, a traveller and botanist.—N.
Sophora, L.	. Leg. Papil.	1737..	from Arabic *Sophero*.—N.
Sopubia, Ham.	.. Scroph.	1825..	after its native name in India.—N.
Sorghum, L.*	.. Gram.	1735..	said to be from *Sorghi*, the Indian name.—N.

* Sorghum, Pers. in Engler-Prantl.

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Soymida, A. Juss.	.. Melia.	1830..	the native Indian name of the plant.—Z.
Spathelia, L.	.. Simarub.	1763..	from *spathe*, a palm-tree; a resemblance name.—N.
Spathiphyllum, Schott.	Araceæ,	1832..	the spathe is leaf like.—N.
Spathodea, P. B.	.. Bignon.	1805..	from *spathe*, a spathe; the calyx is spathecious.—N.
Spatholobus, Hassk..	Leg. Papil.	1842..	from *spathe* and *lobos*; the fruit has a single seed at the apex, and it opens round the seed only.
Spergula, L.	.. Caryophyll.	1735..	from *spargere*, to scatter; referring to the numerous seeds produced.—C.
Spermacoce, (Dill.) L.	Rubia.	1735..	*sperma*, a seed and *akoke*, a point; probably after the pointed calyx teeth on the fruit.—N. *Button-weed.*
Sphæranthus, (Vaill.) L.	Compo.	1737..	from *sphaira* and *anthos*; in allusion to the globular flower heads.
Sphærocarya, Dalz.	.. Olacin.	..	from *sphaira*, a globe, and *karyon*, a nut; in allusion to the globular form of the drupe.—Z.
Sphenoclea, Gärtn..	Campanul.	1788..	from *sphen*, a wedge and *kleio*, to enclose; alluding to the capsules.
Sphenogyne, R. Br.	.. Compo.	1813..	synonym *Ursinia*.
Spilanthes, Jack.*	.. Compo.	1760..	from *spilos*, a spot, and *anthos*, a flower; in allusion to the disk and ray flowers being of different colours. *Para Cress.*
Spinacia, (Tourn.) L.†	Chenopod.	1735..	*spina*, a prickle.—N. *Spinach.*
Spinifex, L.	.. Gram.	1771..	from *spina*, a thorn, the involucral glumes are such.
Spiræa, L.	.. Rosa.	1735..	probably from *speiras*, to wind; the plants are flexible.—N. The classical name.—C.
Spiranthes, L.C. Rich.	Orchid.	1818..	from *spira* and *anthos*; the flowers are on a *twisted* secund, erect spike.
Spirodela, Schleid.	.. Lemna.	1839..	from *spira*, a spiral, and *delos*, distinct.—Z.; the epidermal cells have sinuous walls.
Spironema, Lindl.	.. Commel.	1840..	*speiras*, to wind, *nema*, thread.
Splitgerbera, Miq.	.. Urti.	1840..	commemorative.
Spodiopogon, Trin.	.. Gram.	1820..	*spodo*, *pogon*, ash-grey beard.
Spondias, L.	.. Anacard.	1737..	an old Greek name for the plum.—N.
Sponia, Comm.	.. Urti.	1796..	after Jac. Spon, 1647-1685, a physician at Lyons, who travelled in the interest of botany.—Z.

* Spilanthes, L. in Cooke, Durand and Engler.-Prantl.

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Sporobolus, R. Br.	Gram.	1810	from *spora*, and *bolus*; seeds forming a mass.
Stachyphrynium ‡	Scitamin.	..	
Stachytarpheta, Vahl.†	Verben.	1805	*stachys tarphys*, a thick spike.—N.
Stapelia, L.	Asclep.	1737	after Boderus à Stapel, a physician of Amsterdam, died in 1631.—N. *African Toad-flower.*
Statice, (Tourn.) L.	Plumbagin.	1735	*Statikos*, astringent.—N. *Sea Lavender.*
Staurogyne, Wall.	Acanth.	1831	*stauros*, a cross, and *gyne*.
Stellaria, L.	Caryophyll.	1753	*stella*, a star.
Stemmadenia, Benth.	Apocyn.	1844	
Stemodia, L.	Scroph.	1759	*stemon, dis*; the anthers consist of two separate cells.—N.
Stenolobium, D. Don.	Bignon.	1823	from *stenos, lobos*, narrow lobes.
Stenophyllus, Rafin.	Cyper.	1825	from *stenos, phyllon*, narrow leaves.
Stenotaphrum, Trin.	Gram.	1820	from *stenos*, narrow, and *taphros*, a trench; referring to the cavities in the rachis for the spikelets.—N.
Stephania, Lour.	Menisperm	1790	after Prof. Frederick Stephan of Moscow; died, 1817.—N.
Stephanophysum, Pohl.	Acanth.	1831	from *stephane*, and *physa*, crown bladder.
Stephanotis, Thou.	Asclep.	1806	*stephanos, otos*; alluding the auricles of the staminal crown.—N.
Stephegyne, Korth.	Rubia.	1840	from *stephos* and *gyne*.
Sterculia, L.†	Stercul.	1747	after Sterculius, a demi-god; also derived from *stercus* dung, as some flowers are fœtd.—N.
Stereospermum, Cham.†	Bignon.	1832	from *stereos*, hard, and *sperma*, seed.—N.
Stigmaphyllon, A. Juss.	Malphig.	1832	the stigmas are leafy.—N.
Stipa, L.	Gram.	1753	*stipe*, a silky or feathery substance.—*Esparto Grass.*
Streblus, Lour.	Urti.	1790	from *streblos*, twisted; its branches are such.—N.
Streptocarpus, Lindl.	Gesner.	1828	from *streptos*, twisted, and *karpos*, fruit.—N.
Streptostigma, Thw.	Sapind.	1854	
Striga, Lour.	Sroph.	1790	from the plant being *strigose*.
Strobilanthes, Bl.†	Acanth.	1826	from *strobilos*, a cone, and *anthos*; the flowers form a strobile.—N.
Strombosia, Bl.	Olacin.	1826	from *strombos*, a spinning top; the fruit is pyriform when young, more or less globose when old.—Z.
Strophanthus, DC.	Apocyn.	1802	from *strophos*, a twisted rope, and *anthos*, a flower, the corolla is such.—N.

‡ Stachyphrynium is not noticed in Index Kewensis, Engler-Prantl. & Durand.

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Strychnos, L.†	Logan.	1735	from the Greek for *Solanum* used by Theophrastus.—N. *Poison-nut or Strychnine-plant.*
Stylocoryna, Cav.	Rubia.	1797	the *style* is stout like a *club.*
Stylocoryne, W. & A.	Rubia.	1834	do. do.
Stylodiscus, Benn.	Euphor.	1838	the style is, however, linear in the Bombay species.
Stylosanthes, Sw.	Leg. Papil.	1788	*stylos anthos*; the flower has a very long style.
Suæda, Forsk.	Chenopod.	1775	said to be from Arabic *Suaed.*—N.
Sutera, Roth.	Scroph.	1821	commemorative.
Swertia, L.	Gentian.	1753	after Iman. Swert, a Dutch horticulturist.—N.
Swietenia, Jack.*	Melia.	1760	after Geraud von Swieten, 1700-1772, a Dutch botanist.—N.
Symphorema, Roxb.	Verben.	1798	from *symphoreo*, to bear together: the flowers have as many as six bracts.
Symphyllia, H. Bn.	Euphor.	1858	from *syn* and *phyllon*; the leaves and flowers appear to be together.
Symphytum, (Tourn.) L.	Borag.	1735	*symphuo*, I make to grow together; healing wounds.—N. *Alum or comfrey.*
Symplocos, Jack ‡	Styr.	1760	from *symloke*, union; the stamens are adnate to the corolla tube. *Horse-suyar or sweet-leaf.*
Synadenium, Boiss.	Euphor.	1862	*Syn aden*; the glands of the involucre are united in a cup.—N. *African Milk-bush.*
Synantherias, Schott. §	Araceæ.	1858	*syn*, united, *antheros*, anther.
Syngonium, Schott.	Araceæ.	1829	*syn*, united, *gonion*, angle.
Syzygium, Gärtn.	Myrt.	1788	from *syzygos*, united; the petals come off in a body like a *calyptra.*—Z.
Tabernæmontana, (Plum.) L. ‖	Apocyn.	1737	in honour of James Theodore Tabernæmontanus, a physician to the Elector Palatine died in 1590.—N.
Tacca, Forst.†	Tacca.	1776	the Malay name.—N.
Tagetes, L.	Compo.	1737	Tagus, one of the Etruscan deities.—N. African *or French Marigold.*
Talauma, Juss.	Magnol.	1789	derivation obscure.
Talinum, Adans.	Portulac.	1763	vernacular name given by Negros in Senegal.

* Swietenia, L. in Durand and Engler.-Prantl.
‡ Symplocos, L. in Cooke, Durand and Engler.-Prantl.
§ Excluded by Cooke.
‖ Cooke gives it as a synonym of *Ervamia*.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Tamarindus, (Tourn.) L.	Leg. Cæs.	1735	Arabic *tamr*; the date of India.—N. *Tamarind-tree.*
Tamarix, L.	Tamari.	1735	from Tamaris, a river in Pyrenees, where it abounds (D); the old name used by Pliny.—N. *Tamarisk.*
Tapinocarpus, Dalz.	Araceæ.	1844	*tapeinos*, low, *karpos*, fruit.
Taraxacum, L. *	Compo.	1735	*tarasso*, to alter; a medicinal name.—N.
Tarenna, Gärtn.	Rubia.	1788	from its Cinghalese name.
Taverniera, DC.	Leg. Papil.	1825	after J. B. Tavernier, 1605-1689, a traveller in the Levant.—N. *Indian money-wort.*
Tecoma, Juss.	Bignon.	1789	from its Mexican name.—N.
Tecomaria, Spach ‡	Bignon.	1840	derived from *Tecoma.*
Tecomella, Seem.	Bignon.	1862	dim. of *Tecoma.*
Tectona, L. f.	Verben.	1781	from *tekka*, its native name in Malabar.—N. *Indian teak-tree.*
Telanthera, R. Br.	Amarant.	1818	from *tela*, a web, and *anthera.*
Tephrosia, Pers.	Leg. Papil.	1807	from *tephoros*, ash-coloured; the leaves are Ash-coloured.—N.
Teramnus, P. Br. §	Leg. Papil.	1756	*teramnos*, soft; the pods and leaves are referred to.—N.
Terminalia, L. †	Combret.	1767	the leaves are *terminal* in position; from *terminus* end.—N. *Malabar Almond-tree and Myrobalan-tree.*
Terniola, Tul.	Podostemon.	1852.	
Tetragonia, L.	Ficoid.	1735	alluding to the four-angled fruit.—N.
Tetrameles, R. Br.	Datis.	1826	from *tetra*, four and *melos*, limb; the perianth has four divisions.
Tetranthera, Jacq.	Laura.	1797	the stamens are twelve to twenty in the Bombay species.
Tetrapogon, Desf.	Gram.	1799	in allusion to the four awns to the spikelets.—N.
Tetrastigma, Planch.	Ampel.		the stigma is four lobed in *T. lanceolarium*, syn. *Vitis lanceolaria.*
Thalictrum, (Tourn.) L.	Ranun.	1737	from *thalo* to grow green, because of the bright green colour of the young sprouts; a name used by Dioscorides.—N. *Rue Anemone or Meadow-rue.*
Thelepogon, Roth.	Gram.	1817	*thele*, a teat, and *pogon*, a beard.
Themeda, Forsk.	Gram.	1775	from the Arabic name *Thaemed.*—Z.
Theobroma, L.	Stercul.	1737	*theos broma*; fit to be the food of God.—N. *cocoa.*

* Taraxacum, Hall, 1742, in Durand and Engler-Prantl.
‡ Tecomaria, *Fenzl* in Engler-Prantl. and *Bur.* in Durand.
§ Teramnus, Sw. 1788, in Cooke. Engler-Prantl and *Bur.* in Durand.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Theriophonum, Bl.	Araceæ.	1835	
Thespesia, Soland-ex. Corr. † *	Malva.	1807	from *thespesios*, divine; planted in India near temples.—N. *Indian Tulip-tree.*
Thevetia, L.	Apocyn.	1737	after Andr. Thevet, 1502-1590, a French monk, who travelled in Brazil and Guiana.—N.
Thlaspi, (Tourn.) L.	Crucifer.	1737	*thlas* to bruise; its seeds being bruised as a condiment.—N. *Besom-weed.*
Thrinax, L. f.	Palm.	1788	meaning a fan.—N. *Broom Palm and Royal Palm etto-palm.*
Thuja, L.	Conifer.	1737	from *Thuga*, the old Greek name.
Thunbergia, Retz. ‡	Acanth.	1776	in honour of C. P. Thunberg, 1743-1822, Professor at Upsela.—N.
Thunia, Rchb. f.	Orchid.	1852	after Count Thun-Tetschen, who had an important collection of orchids.—B.
Thuya, L.	Conifer.	1735	from *thuga* the old Greek name used by Theophratus.—N. *American Arbor-vitæ.*
Thymus, (Tourn.) L.	Labiat.	1735	the old Greek name used by Theophrastus.—N.
Thyrsostachys, Gamble	Gram.		with a bunch like inflorescence.
Thysanolæna, Nees †	Gram.	1835	*thysanotos*, fringed?
Tiaridium, Lehm.	Boragin.	1818	*tiara*, a Persian diadem.
Tiliacora, Colebr.	Menisperm.	1822	from *tilia-kora*, the Bengalese name of the plant.—N.
Tillæa, § (Mich.) L.	Crasul.	1735	after M. A. Tilli, 1653-1740, an Italian botanist.—N.
Tinnea, Kotschy. and Peyr.	Labiat.	1867	
Tinospora, Miers. †	Menisperm.	1851	from *tino*, to extend, and *spore*, a seed; in allusion to the extended shape of the seeds.
Tithonia, Desf.	Compo.	1789	Tithonus, a fourite of Aurora; a mythological name.—N.
Toddalia, Juss.	Ruta.	1789	a Malbar name.—N.
Torenia, L. †	Scroph.	1751	in honour of Olef Toren, a Swedish clergyman, died in 1753—N.
Tournefortia, L.	Boragin.	1735	in honour of Joseph Pitton de Tournefort, 1656-1708, a botanist.—N.
Toxocarpus, W. & A.	Asclep.	1834	from *toxos*, a bow, and *karpos*, a fruit; the follicles are curved.

* Thespesiea, Corr. in Durand and Engler-Prantl.
‡ Thunbergia L. f. in Cooke, Engler-Prantl. and Durand.
Doubtful whether found at all in the Bombay Presidency.

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GENUS AND AUTHOR.	NATURAL ORDER.	DATE.	DERIVATION AND COMMON NAME.
Trachycarpus, Wendl.	Palm.	1861..	the fruit is rough.—N.
TRACHYS, Pers.	.. Gram.	1805..	*trachys*, rough; the spike is remarkably rough.
Tradescantia (Rupp.). L.	Commel.	1735..	after John TRADESCANT gardener to Charles I. died in 1638—N.
TRAGIA*, (Plum.) L.	.. Euphor.	1737..	after Jerome Bock-generally called TRAGUS the Greek for Bock (Buck), a German botanist.—N.
Tragopogon (Tourn.)L.	Compo.	1735..	Goat's beard; alluding to the long silky beard of the seeds.—N. *Shepherd's-clock and Salsify.*
TRAGUS, Hall.	.. Gram.	1768..	from *tragos*, a goat.
TRAPA, L. †	.. Onagra.	1737..	from *calcitrapa*, a spiny implement used to impede the progress of cavalry in ancient time.—N. *Water-chestnut or Shingada.*
TREMA, Lour.	.. Urti.	1790..	*trems*, to tremble.
TREVESIA, Vis.	.. Aralia.	1840..	after the family of TREVES de Boufigli at Padua, patrons of botany.—N.
TREWIA, L.	.. Euphor.	1737..	after C. J. TREW, 1695-1769, a botanist of Nuremberg.—N.
TRIANTHEMA, Sauv.‡	.. Ficoid.	1751..	*Treis anthos*; the flowers are in threes.—N.
TRIAS, Lindl.	.. Orchid.	1829..	*treis* three; the floral envelope, are alluded to.—N.
TRIBULUS, (Tourn.) L.	Zygophyll.	1735..	*treis bolos*, alluding to the projections to each carpel.—N. *Caltrops.*
Trichaurus, Arn.	.. Tamari.	1834..	*thrix*, the hair.
Trichelostylis, Lestib.	.. Cyper.	1819..	*thrix*, the hair, and *stylos*.
TRICHODESMA, R. Br.	.. Borag.	1810..	from *trichos* hair, and *desmos*, a bond; the filaments and connectives are hairy.
TRICHOLÆNA, Schrad.†	Gram.	1824..	from *trichos*, and læna, mantle; referring to the silky hairs on the spiklets.
TRICHOLEPIS, DC.	.. Compo.	1833..	from *trichos*, hair and *lepis*, a scale; alluding to the L—seriate aristate acuminate involucral bracts.
TRICHOSANTHES, L.†	.. Cucurbit.	1737..	*hairy flowers*; the corolla is fimbriate.—N. *Snake-gourd.*
TRIDAX, L.	.. Compo.	1737..	*treis akis*; the ray florets have three points.—N.
TRIGONELLA, L.†	.. Leg. Papil.	1737..	*treis gonu*, the standard and wings together present a triangular appearance.—N.

* Cooke has omitted the author's name against this genus.

‡ Trianthema, L. 1753 in Cooke, Engler-Prantl. and Durand.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Trigonostemon, Bl.	.. Euphor.	1825..	so called from the *triangular stamens*; Cooke does not describe the stamens as such.
Triphasia, Lour.†	.. Ruta.	1790..	*triphasios*, tripple; see the sepals and petals.—N.
Tripogon, Roth.	.. Gram.	1821..	from *treis* and *pogon*, alluding to the three bristles of the lower valves.
Tristachya, Nees.	.. Gram.	1829..	in allusion to the spikelets being in clusters of three at the tips of the branchlets of a raceme.
Tristellateia, Thouars.	.. Malpigh.	1806..	
Triticum, L.	.. Gram.	1735..	the old Latin name for wheat, and probably from *tritus*, ground.—N. *Wheat.*
Triumfetta, (Plum.) L.	Til.	1737..	after Giov. Batt. Trionfetti. 1658-1708, an Italian botanist, —N.
Tropæolum, L.	.. Geran.	1737..	*tropaion*, a trophy; the leaves are of the form of a buckler, and the flowers of a helmet.—N. *Indian Cressor Yellow Larkspur.*
Tubiflora,* Gmel.	.. Acanth.	1791..	*tubes*, tube, *flora*, flower.
Turnera, (Plum.) L.	.. Turnera.	1737..	after William Turner, a herbalist, died in 1568.—N.
Turpinia, Vent.†	.. Sapind.	1803..	after P. Turpin, a French botanical artist, died in 1840.—N.
Turræa, L.†	.. Melia.	1771..	after George Turra, 1607-1688, Professor of Botany at Padua. —N.
Tydæa, Decne.	.. Gesner.	1848..	after Tydeus, a son of OEneus, King of Calydon.—N.
Tylophora, R. Br.†	.. Asclep.	1809..	from *tylos*, a swelling, and *phoreo*, to bear; alluding to the ventricose pollen-masses (D) probably alludes to the coronal lobes.—N.
Typha, L.†	.. Typha.	1735..	from *typhos*, a marsh; a habitat name (D), the old Greek name used by Theophrastus.—N. *Bulrush.*
Typhonium, Schott.	.. Araceæ.	1829..	from typhon, a mythological giant.—N.
Ulmus, (Tourn.) L.	.. Urti.	1735..	the old Latin name used by Virgil.—N.
Uniola, L.	.. Gram.	1737..	from *unus*, one; the glumes are united.—N. *Spike Grass.*

* This is an adjective and not a substantive. See the note on this point in Cooke, Bombay Flora, II, 344.

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GENUS AND AUTHOR.	NATURAL ORDER.	DATE.	DERIVATION AND COMMON NAME.
UNONA, L. f.	.. Anona.	1781..	from *uno*, to unite; with reference to the stamens and carpels appearing united (D); probably a veriation of Anona.—N.
Urania, Schreb.	.. Scit.	1789..	from *ouranos*, heaven.
URARIA, Desv.	.. Leg. Papil.	1813..	*oura*, a tail; alluding to the inflorescence.—C.
URENA, (Dill.) L.	.. Malva.	1735..	meaning stinging; the fruit is covered with glochidiate spines.
URGINEA, Steinh.	.. Lil.	1834..	after the name of an Arab tribe in Algeria, Ben URGIN.—N.
Urochloa, Beauv.*	.. Gram.	1812..	from *ura* and *chloa*; tailed grass.
Uropetalum, Burch.‡	.. Lil.	1822..	having tailed petals.
Urostigma, Gaspar.	.. Urti.	1844..	from *ura* and *stigma*; the stigma is appendiculate.
Urtica, (Tourn.) L.	.. Urti.	1735..	from *uro*, to burn; in allusion to the stinging hairs.—N. *Stinging Nettle.*
UTRICULARIA, L.	.. Lentibul.	1735..	with reference to the *utriculus*, or bladders on the plants.—N. *Bladderwort.*
UVARIA, L.	.. Anona.	1747..	from *uva*, a grape bunch; the resemblance lies in the fruit clusters of the two plants.—N.
Vagaria, Herb.	.. Amaryll.	1837..	from *vago*, to wander.
VAHLIA, Thunb.	.. Saxifrag.	1782..	commemorative.
VALLARIS, Burm. f.†§.	Apocyn.	1768..	probably from *vallo*, to enclose; it being used for fences in Java.—N.
VALLISNERIA, (Mich.) L.†	Hydrocharit.	1737.	after Antonio VALLISNERI, 1661-1730, an Italian botanist of Padua.—N. *Eelgrass or Tape-grass.*
VANDA, Jones.†‖	.. Orchid.	1795..	from its Indian name.—N.
VANDELLIA, L.	.. Scroph.	1767..	after Dominico VANDELLI, Professor of botany at Lisbon.—N.
VANGUERIA, Juss.	.. Rubia.	1789..	*voa-vanguer*, its name in Madagascar.—N.
Vanilla, (Plum.) Mill.	Orchid.¶	1752..	Spanish *vainilla*, a sheath of knife; the pod suggests the anology.
VATERIA, L.†	.. Diptero.	1737..	after VATER, a German.
Vatica, L.	.. Diptero.	1771..	from *vates*, divine; the shrub is used in China in religious ceremony.—Z.

* Uocrhloa, Kth. in Durand and Engler-Prantl.
‡ Uropetalum, Ker. in Engler-Prantl and Durand, Index Kewensis adopts Uropetalon, KerGawl, 1816.
§ Vallaris, Burm. in Cooke, Engler.-Prantl. and Durand.
‖ Vanda, R. Br. 1820 in Cooke, Engler.-Prantl. and Durand.
¶ Vanilla, Sw. 1799 in Engler.-Prantl. and Durand.

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Ventilago, Gärtn.	Rham.	1788	from *ventus*, wind, and *ago*, to drive; the winged fruits are wind driven (D); *ventilo*, to be exposed to the wind.—N.
Verbena, L.	Verben.	1737	said to be from the celtic name *ferfaen* (D); the old Latin name used by Virgil.—N.
Verbesina, L.	Compo.	1735	altered from *Verbena*.—N.
Vernonia, Schreb.	Compo.	1791	in honour of William Vernon, a botanical traveller in North America.—N.
Veronica, L.†	Scroph.	1735	probably from *hiera eicon*, sacred image. *Angel's-eyes or Speedwell.*
Viburnum, L.	Caprifol.	1735	the Latin name of the Wayfaring-tree.—C.
Vicia, (Tourn.) L.	Leg. Papil.	1735	the old Latin name.—N. *Broad Bean.*
Vicoa, Cass.	Compo.	1829	in honour of G. B. Vico, an Italian scientific author of the end of the seventeenth century.—C.
Victoria, Lindl.	Nymph.	1837	after Her Majesty Queen Victoria.—N. *Victoria Lily.*
Vigna, Savi.†	Leg. Papil.	1826	after Dominic Vigni, author of a commentary on Theophastus. 1625.—N. *Cow-pea.*
Villarsia, Vent.	Gentia.	1803	after Dominique Villars, 1745-1814, Professor at Grenoble.—N. *Water-lily.*
Villebrunea,* Gaud.	Urti.	1844-66	Commemorative.
Vinca, L.	Apocyn.	1735	from *vinculum*, a band, because of the flexibility of the branches (D.); the old Latin name used by Pliny.—N. *Band-plant or Periwinkle.*
Viola, (Tourn.) L.†	Viola.	1735	the old Latin name used by Virgil.—N.
Viscaria,‡ Riv. ex Rupp.	Caryphyll.	1745	included under *Lychnis.*
Viscum, (Tourn.) L.	Loranth.	1737	the old Latin name used by Virgil.—N. *Mistletoe.*
Vitex, (Tourn.) L.†	Verben.	1735	from *vico*, to bind; in allusion to the flexibility of the branches (D.); the old Latin name used by Pliny.—N. *Agnus-castus.*
Vitis, (Tourn.) L.†	Ampel.	1735	from Celtic *gwid*, the best of trees (D.); the old Latin name used by Virgil.—N. *Grape Vine.*
Vittadinia, A. Rich.	Compo.	1832	after Dr. C. Vittadini, an Austrian, who wrote on Fungi, 1826-1842.—B. After Dr. Carlo Vittadini; a physician and botanist in Milan, died in 1865.—Z.

* Doubtfully indigenous. ‡ Viscaria, Roehl. in Durand and Engler-Prantl.

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Vogelia, Lam.	.. Plumb.	1792..	after Herr Vogel, a German botanist.—N.
Volkameria, L.	.. Verben.	1735..	Commemorative.
Volutarella, Cass.	.. Compo.	1826..	from *volutus*, rolled.
Wagatea, Dalz.†	.. Leg. Cæs.	1851..	adapted from the vernacular name *Wagati*.
Wahlenbergia, Schrad.	Campanul.	1814..	after a German botanist George Wahlenberg of Upsala, 1780-1851.—N. *Australian Harebell.*
Wallichia, Roxb.	.. Palm.	1819..	after Dr. Nathanael Wallich, a Danish botanist, 1786-1854; he worked on Indian plants and was superintendent of the Botanic Gardens at Calcutta.
Wallrothia, Roth.	.. Verben.	1821..	Commemorative.
Walsura, Roxb.	.. Melia.	1814..	from Telangu name.—N.
Waltheria, L.	.. Stercul.	1737..	after Aug. Fried. Walther, 1688-1746, Professor at Leipzig.—N.
Washingtonia, Wendl.	Palm.	1879..	after George Washington, the Great American patriot.—N.
Webera, Schreb.	.. Rubia.	1791..	after George Henry Weber, 1752-1828, Professor at Kiel.—N.
Wedelia, Jacq.†	.. Compo.	1760..	named after a German botanist, George Wolfgang Wedel, 1645-1721, Professor of Botany at Jena.—N.
Wendlandia, Bartl.	.. Rubia.	1830..	after Henry Ludovicus Wendland, a botanist of Hanover. 1755-1828.—N.
Whitlavia, Harv.*	.. Hydrophyll.	1846.	included under *Phacelia*.
Wigandia, H. B. K.	.. Hydrophyll.	1818..	after John Wigand, 1523-1587, a Bishop of Pomerania.—N.
Wisneria, M. Micheli.	Alisma.	1881..	Commemorative.
Wistaria, Nutt.	.. Leg. Papil.	1818..	in honour of Casper Wistar, 1761-1818, Professor of Anatomy in the University of Pennsylvania.—N. *Kidney-bean-tree.*
Wisteria, Nutt.	.. Leg. Papil.	1818..	wrong spelling of Wistaria.
Withania, Paug.	.. Solan.	1824..	supposed to be in honour of H. Witham, a British geologist in the nineteenth century.—C.
Wolffia, Horkel.	.. Lemna.	1839..	in honour of J. F. Wolfe; a writer on Lemna.—C.
Wollastonia, DC.	.. Compo.	1834..	in honour of Dr. Wollaston, a natural philosopher.—D.
Woodfordia, Salisb.	.. † Lythr.	1806..	after J. Woodford, who wrote about plants around Edinburgh in 1824.—N.

* Whitlavia, *Gray*, in Engler-Prantl. *Hook.* in Durand.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Woodrowia, Stapf.	.. Gram.	1896..	after G. Marshal Woodrow, Professor of Botany at the College of Science, Poona, India.
Wrightia, R. Br.	.. Apocyn.	1809..	after Dr. W. Wright, a Scotch botanist. *Pala Indigo-plant.*
Xanthium, (Tourn.) L.	Compo.	1735..	from *xanthos*, yellow; the infusion yields an yellow dye.—D. The old Greek name used by Dioscorides.—N.
Xanthochymus, Roxb..	Guttifer.	1798..	named in allusion to the yellow latex of the fruit.
Xanthosoma, Schott...	Araceæ.	1832..	*xanthos soma*; alluding to the large, lobed, depressed, yellow stigma.—N.
Xanthoxylon, Spreng..	Ruta.	1818..	meaning yellow wood. *Chinese-pepper.*
Xeranthemam, (Tourn.) L.	Compo.	1735..	from *xeros*, dry, and *anthemon*, a blossom; the flowers retain their form and colour for years. —N. *Immortal-flowers.*
Ximenia, (Plum.) L...	Olacin.	1737..	after Francis Ximenes, a Spanish monk who wrote on Mexican plants in 1615.—N. *Mountain-plum.*
Xylia, Benth.	.. Leg. Mimo.	1842..	
Xyris, (Gronov.) L...	Xyrid.	1737..	from *xyros*, acute; the allusion is to the leaf tips (D.); the old Greek name used by Dioscorides.—N.
Yucca, (Dill.) L.	.. Lil.	..	a native name.—*Adam's-needle.*
Zamioculcas, Schott..	Araceæ.	1856..	resembling *Zamia* and *Culcasia*.—N.
Zannichellia, (Mich.) L.	Naiad.	1735..	after John Jerome Zannichelli, 1662-1729, a Venetian botanist. —N. *Horned Pondweed.*
Zanonia, L.	.. Cucurbit.	1737..	after Giac. Zanoni, 1615-1682, a Professor at Bologna.—Z.
Zanthoxylum, L.	.. Ruta.	1737..	*xanthos xylon*; the yellow colour is in the roots.—N. *Chinese-pepper.*
Zapania, Lam.*	.. Verben.	1791..	after Paul Ant. Zappa of the Botanic Garden at Pavia.—Z.
Zea, L.	.. Gram.	1737..	*Zea* or *Zeia*, the old Greek name for a cereal used by Homer.—N. *Maize or Indian-corn.*

* Zapania, Scop. in Durand and Engler-Prantl.

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Genus and Author.	Natural Order.	Date.	Derivation and Common Name.
Zebrina, Schnitzl.	.. Commel.	1849..	the leaves are striped in a *zebra-like* manner.—N.
Zehneria, Endl.	.. Cucurbit.	1833..	after Joseph Zehner, a botanical artist of Vienna.
Zephyranthes, Herb.	.. Amaryll.	1821..	*zephyros*, the west wind, and *anthos*, a flower; a fanciful name.—N. *West-wind Lily.*
Zerumbet, Wendl.	.. Scitamin.	1798..	a vernacular name.
Zeuxine, Lindl.	.. Orchid.	1826..	*zeuxis*, a joining; the petals cohere with the upper sepal.—N.
Zingiber, Adans †	.. Scitamin.	1763..	from *Zingiberis*, used by Dioscorides; from Sanskrit.—N. *Ginger.*
Zinnia, L.	.. Compo.	1759..	after John Godfrey Zinn, 1727-1759, Professor of Botany at Gottingen.—N.
Zizyphus, (Tourn.) † *	L. Rham.	1735..	*Zizouf* is the Arabic name of Z. Lotus.—N. *Jujube-tree.*
Zornia, Gmel.	.. Leg. Papil.	1791..	after John Zorn, 1739-1799, a botanist of Bavaria.—N.
Zosimia, Biel. ‡	... Umbel.	1819..	*Zosimos*, vital.
Zostera, L.	.. Naiad.	1747..	from *zoster*, a belt; the leaves are alluded to.—N.
Zoysia, Willd.	.. Gram.	1801..	after Karl von Zoys, a German botanist.—Z.
Zygophyllum, L.	.. Zygophyll.	1735..	from *zygon*, and *phyllon*; alluding to the pairs of leaflets.—N. *Bean-caper.*

Generic Names arranged according to Derivations.

The generic names of plants may be classified according to their derivations into the three major heads of descriptive names, commemorative names and common plant names modified into generic ones. Under the first head are included those describing the plant's form or properties as well as those giving the plant's habitat or geography. Under the second head are given personal names as well as mythological ones. Under the third head are brought together classical as well as vernacular names of plants. This grouping of names according to derivations is, of course, artificial, but it brings together often times names that are formed alike and sound alike, and supplies fresh associations to aid memory. Apart from this fact, it puts before us clearly in what directions botanists' predilections lie in the matter of forming generic names. One may also judge better the comparative merits and defects of the different types of names. But the main object in giving these lists that follow is to assist the local botanists. For this purpose it was found necessary to affix the name of the order. The lists are not exhaustive. On the other hand some names occur under more than one sub-head.

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* Zizyphus, Juss. in Cooke, Engler-Prantl. and Durand.

‡ Zosimia, Hoffm. in Cooke and Durand; Zosima, Hoffm. 1814 in Index Kewensis.

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The following is the outline of the classification that follows :—

DESCRIPTIVE NAMES.

I.—Names bearing direct Morphological Descriptions.

A.—Names with vague descriptions.

B.—Names with precise descriptions.

(*a*) Names after the plant as a whole.

(*b*) Names describing the parts of the plant.

1—18. Names after the root, the stem and so on.

II.—Names bearing description by comparisons.

A.—Names based on botanical comparisons.

B.—Names based on zoological comparisons.

C.—Names based on a comparison with inanimate objects.

III.—Names describing Properties and Uses.

IV.—Habitat Names.

V.—Names connected with Geography.

VI.—Miscellaneous Groups of Descriptive Names.

A.—Names indicating beauty or sweetness.

B.—Names describing colours.

C.—Names involving numbers.

D.—Names involving time.

E.—Names that are depreciative.

F.—Names bearing incorrect descriptions.

COMMEMORATIVE NAMES.

I.—Commemorative Names derived from History.

II.—Commemorative Names derived from Mythology.

GENERIC NAMES DERIVED FROM THE COMMON NAMES OF PLANTS.

I.—Names taken from the Greek or Latin Plant Names.

II.—Names taken from Arabic or Persian.

III.—Names derived from the Indian Languages.

IV.—Names of a Vernacular Origin other than Arabic or Indian.

APPENDIX.

Names with a doubtful or obscure meaning.

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DESCRIPTIVE NAMES.

I. Names bearing Direct Morphological Descriptions.

A.—Names with vague descriptions.

Abronia, Nyct.
Abrus, Leg. P.
Acacia, Leg. M.
Acalypha, Euphor.
Acampe, Orchid.
Actephila, Euphor.
Acrocephalus, Labiat.
Adenochlæna, Euphor.
Adina, Rubia.
Ætheilema, Acanth.
Ageratum, Compo.
Ailanthus, Simarub.
Aizoon, Ficioid
Aleurites, Euphor.
Allium, Lilia.
Amarantus, Amarant.
Anacardium, Anacar.
Aniseia, Convol.
Anogeissus, Combret.
Asperula, Rub.
Celosia, Amarant.
Chasalia, Rubia.
Chloris, Gram.
Chrozophora, Euphor.
Cleome, Capparid.
Conocephalus, Urtic.
Conyza, Compo.
Cuphea, Lythr.
Cyclamen, Primul.
Cyclea, Meni.*
Daucus, Umbell.
Dichoris, Commel.
Diplachne, Gram.
Dyschoriste, Acanth.
Eclipta, Compo.
Elionurus, Gram.
Elytrophorus, Gram.
Eucalyptus, Myrt.
Euchlæna, Gram.
Eulophia, Orchid.
Eurya, Rosa.
Eurycles, Amaryll.
Flagellaria, Flag.
Gasteria, Lil.
Gnaphalium, Compo.
Grona, Leg. P.
Grumilea, Rubia.
Helicteris, Stercul.
Hemicyclea, Euphor.†
Homonoia, Euphor.
Hypœstes, Acanth.
Hypolytrum, Cyper.
Hypoxis, Amaryll.
Hyptis, Labiat.
Impatiens, Geran.
Lepidium, Crucifer.
Mezoneurum, Leg. C.
Micropera, Orch.
Monechma, Acanth.
Oligomeris, Resed.
Operculina, Convol.
Oplismanus, Gram.
Orophea, Anon.
Orthosiphon, Labiat.
Oxalis, Geran.
Pandorea, Bignon.
Pappophorum, Gram.
Perotis, Gram.
Petalidium, Acanth.
Phoberos, Bix.
Pholidota, Orchid.
Pimpinella, Umbel.
Pogonia, Orchid.
Psoralea, Leg. P.
Scolopia, Bix.
Streblus, Urtica.
Syzygium, Myrt.
Trachys, Gram.
Tylophora, Aselep.
Vinca, Apocyn.
Volutarella, Compo.
Zeuxine, Orch.

B.—Names with precise descriptions.

a. Names after the Plant as a Whole.

Biophytum, Geran.
Chlorophytum, Lil.
Limnophyton, Alis.
Symphytum, Borag.

b. Names describing the Parts of the Plant.

1. *Names after the root.*

Acanthorhiza, Palm.
Hygrorhiza, Gram.
Ophiorhiza, Rubia.
Pachyrhizus, Leg. P.
Rhizophora, Rhizo.

2. *Names after the wood.*

Chloroxylon, Melia.
Citharexylum, Verb.
Claoxylon, Euphor.
Dysoxylon, Melia.
Erythroxylon, Lin.
Hæmatoxylon, Leg. M.
Haloxylon, Cheno.
Myroxylon, Leg. P.
Ophioxylon, Apo.
Oroxylum, Big.
Sideroxylon, Sapot.
Xanthoxylon, Ruta.

3. *Names after the stem or branches.*

Ancistrocladus, Diptero.
Eriocaulon, Erioc.
Goniocaulon, Compo.
Osyris, Santal.
Rhamnus, Rham.

* Relates to the corolla. † Relates to the stigma.

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4. *Names after the leaf.*

Allophylus, Sapind.
Bryophyllum, Crass.
Bulbophyllum, Orch.
Calophyllum, Gutti.
Ceratophyllum, Cer.
Cyanophyllum, Melasto.
Dysophylla, Lab.
Graptophyllum, Acan.
Phyllanthus, Euphor.
Phyllarthron, Bignon.
Phyllocactus, Cact.
Stenophyllus, Cyper.
Zygophyllum, Zygo.

5. *Names after the inflorescence.*

Agrostistachys, Euphor.
Coleospadix, Palm.
Dichrostachys, Leg. M.
Gymnostachium, Acanth.
Microstachys, Euphor.
Phacelia, Hydrophyll.
Psilostachys, Amar.
Pycnostachys, Lab.
Stachyphrynium, Scit.
Stachytarpheta, Verb.
Thyrostachys, Gram.
Tristachya, Gram.

6. *Names after the flower.*

Æschynanthus, Gen.
Aggeianthus, Orchid.
Anthemis, Compo.
Anthocephalus, Rubia.
Anthurium, Ara.
Calanthe, Orch.
Campylanthus, Scroph.
Cheiranthus, Cruc.
Cleistanthus, Euphor.
Clianthus, Leg. P.
Cryptanthus, Bromel.
Cyrtanthus, Amaryll.
Desmanthus, Leg. M.
Dianthus, Caryo.
Eranthemum, Acanth.
Erianthus, Gram.
Galanthus, Amaryll.
Hæmanthus, Amaryll.
Haplanthus, Acanth.
Helianthus, Compo.
Lasianthus, Rubia.
Limnanthemum, Gent.
Mesmbryanthemum, Fic.
Micranthus, Acanth.
Nyctanthes, Olea.
Osmanthus, Olea.
Pardanthus, Irid.
Pedilanthus, Euphor.
Phyllanthus, Euphor.
Plectranthus, Lab.
Polyanthes, Amarylly.
Rhodanthe, Compo.
Sarcanthus, Orchid.
Schizanthus, Solan.
Sphæranthus, Compo.
Spilanthes, Compo.
Spiranthes, Orchid.
Strobilanthes, Acanth.
Strophanthus, Apocyn.
Telanthera, Amarant.
Trichosanthes, Cucur.
Tubiflora, Acanth.
Zephyranthus, Amaryll.
Zeranthemum, Compo.

6. *Names after the thalamus.*

Goniothalamus, Anon.

7. *Names after the calyx.*

Calycopteris, Combr.
Calysaccion, Gutti.
Dimorphocalyx, Euphor.

8. *Names after the petals.*

Bursinopetalum, Corn.
Cirrhopetalum, Orchid.
Holoptelea, Urti.
Lophopetalum, Celas.
Saccopetalum, Anon.

9. *Names after the spur.*

Centranthera, Scroph.
Centratherum, Compo.
Dicentra, Fumar.
Diplocentrum, Orchid.
Plectronia, Rubia.

10. *Names after the stamens.*

Andrographis, Acanth.
Aphelandra, Acanth.
Calliandra, Leg. M.
Callistemon, Myrt.
Crossandra, Acanth.
Cyphomandra, Solan.
Dolichandrone, Bignon.
Gomphandra, Olac.
Gynandropsis, Cappar.
Lagenandrea, Convol.
Meriandra, Lab.
Nectandra, Laur.
Podostemon, Podo
Pogostemon, Lab.
Stemodia, Scroph.

11. *Names after the filaments.*

Aglaonema, Arac.
Anisonema, Euphor.
Artanema, Scroph.
Gymnema, Asclep.
Homalomena, Arac.
Nemedra, Melia.
Spironema, Commel.

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12. *Names after the anthers.*

Adenanthera, Leg. M.
Alternanthera, Amarant.
Cardanthera, Acanth.
Centranthera, Scroph.
Centratherum, Compo.
Cyrtanthera, Acanth.
Dianthera, Acanth.
Hymenantherum, Compo.
Oxytenanthera, Gram.
Platanthera, Orch.
Pogonatherum, Gram.
Renanthera, Orch.
Telanthera, Amarant.

13. *Names after the gynœcium.*

Gynandropsis, Capparid.
Gynerium, Gram.
Gynocardia, Bix.
Gynura, Compo.
Mitragyne, Rubia.
Myrogyne, Compo.
Sphenogyne, Compo.
Staurogyne, Acanth.
Stephegyne, Rubia.

14. *Names after the style.*

Astylis, Euphor.
Bulbostylis, Cyper.
Cheirostylis, Orchid.
Fimbristylis, Cyper.
Microstylis, Orchid.
Peristylus, Orchid.
Piptostylis, Ruta.
Pleurostylia, Celas.
Rhychostylis, Orchid.
Sclerostylis, Ruta.
Stylosanthes, Leg. P.

15. *Names after the stigma.*

Cephalostigma, Campa.
Cosmostigma, Asclep.
Mastostigma, Asclep.
Sarcostigma, Olac.
Stigmaphyllon, Malp.
Streptostigma, Sapind.,
Urostigma, Urti.

16. *Names after the fruit.*

Alysicarpus, Leg. P.
Argyrolobium, Leg. P.
Artocarpus, Urt.
Callicarpa, Verb.
Caryopteris, Verb.
Chiococca, Rub.
Chrysalidocarpus, Palm.
Coccoloba, Polygon.
Corallocarpus, Cucur.
Cryptocarya, Laur.
Didymocarpus, Gent.
Dipterocarpus, Diptero.
Erinocarpus, Tilia.
Glycicarpus, Anacard.
Gyrocarpus, Combr.
Halopyrum, Gram.
Hydnocarpus, Bix.
Lonchocarpus, Leg. P.
Madacarpus, Compo.
Micrococca, Euphor.
Myxopyrum, Olea.
Ochrocarpus, Gutti.
Paracaryum, Borag.
Polycarpæa, Caryo.
Polycarpon, Caryo.
Psophocarpus, Leg. P.
Pterocarpus, Leg. P.
Pteropyrum, Polygon.
Rhamphicarpa, Scroph.
Schizolobium, Leg. C.
Sclerocarpus, Compo.
Scleropyron, Santl.
Semecarpus, Gesner.
Solenocarpus, Anacard.
Spatholobus, Leg. P.
Sphærocarya, Olac.
Streptocarpus, Gesner.
Toxocarpus, Ascelp.
Trachycarpus, Palm.

17. *Names after the seed.*

Baliospermum, Euphor.
Cardiospermum, Sapind.
Cochlospermum, Bix.
Cyanospermum, Leg. P.
Cyrtosperma, Arac.
Dichaespermum, Commel.
Dicœlospermum, Cucur.
Dictiosperma, Palm.
Gymnosporia, Celas.
Lophospermum, Scroph.
Pittosporum, Pitto.
Plecospermum, Urti.
Pterospermum, Ster.
Ptychosperma, Palm.
Rhynchospora, Cyper.
Speracoce, Rubia.
Sporobolus, Gram.
Stereospermum, Bignon.
Tinospora, Meni.

18. *Names after minor morphological members.*

Pteron, a wing.

Aspidiopteris, Malpig.
Calycopteris, Combret.
Caryopteris, Verben.
Dicliptera, Acanth.
Dipterocarpus, Dipter.
Dipterygium, Cappar.
Elytrophorum, Gram.
Helipterum, Compo.
Heptapleurum, Aral.
Pterocarpus, Leg. P.
Pteropyrum, Polygon.
Pterospermum, Stercul.

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Stemma, a crown.

Agrostemma, Caryo.
Argostemma, Rubia.
Callistemma, Dipsa.
Elatostema, Urti.
Enicostemma, Gent.
Heterostemma, Asclep.
Holostemma, Asclep.
Sarcostemma, Asclep.

Aden, a gland.

Adenanthera, Leg. M.
Adenochlæna, Euphor.
Adenoon, Compo.
Adenophora, Campan.
Adenostemma, Compo.
Leptadenia, Asclep.
Ochradenus, Resed.
Stemmadenia, Apocyn.
Synadenium, Euphor.

Pogon, a beard.

Enneapogon, Gram.
Lasiopogon, Compo.
Pogonatherum, Gram.
Pogonia, Orch.
Pogostemon, Lab.

Glossa, a tongue.

Erioglossa, Sapind.
Glossocardia, Compo.
Glossogyne, Compo.
Salpiglossis, Solan.

Coma, a tuft of hairs.

Brachycome, Compo.
Dicoma, Compo.

II. Names bearing Description by Comparisons.

A.—Names based on botanical comparisons.*

Acanthodium, Acanth.
Actinodaphne, Laur.
Alocasia, Arac.
Alseodaphne, Laur.
Ampelocissus, Ampel.
Anaphalis, Compo.
Archontophœnix, Palm.
Ariopsis, Arac.
Arisæma, Arac.
Arundinella, Gram.
Asparagopsis, Lil.
Bryonopsis, Cucur.
Cassytha, Laur.
Castanospermum, Leg. P.
Cedrela, Melia.
Cistanche, Oroban.
Citrullus, Cucur.
Crocosmia, Irid.
Cucurbita, Cucur.
Cyminosma, Ruta.
Filicium, Sapind.
Ionidium, Viol.
Ipomœa, Convol.
Juncellus, Cyper.
Linaria, Scroph.
Lotononis, Leg. P.
Melanthesiopsis, Euphor.
Melia, Melia.
Mniopsis, Sapot.
Mollugo, Fic.
Moringa, Moring.
Morocarpus, Urt.
Nothopegia, Anacard.
Ochna, Och.
Peperomia, Piper.
Peplidium, Scroph.
Petunia, Solan.
Portulacaria, Portu.
Pothomorphe, Piper.
Pseudanthistiria, Gram.
Quamoclit, Convol.
Rhodanthe, Compo.
Tecomella, Bignon.
Zamioculas, Arac.

*B.—Names based on zoological** comparisons.*

Ægiceras, Myrsin.
Æluropus, Gram.
Aquilegia, Ranun.
Blepharis, Acanth.
Blepharispermum, Compo.
Boucerosia, Asclep.
Butomus, Alis.
Casuarina, Casu.
Caturus, Euphor.
Centipeda Compo.
Cephalocroton, Euphor.
Cerastium, Caryo.
Ceratonia, Leg. M.
Chrysalidocarpus, Palm.
Coreopsis, Compo.
Coriandrum, Umbel.
Croton, Euphor.
Curculigo, Amaryll.
Cynara, Compo.
Cynodon ;Gram.
Cynoglossum, Borag.
Cyphomandra, Solan.
Dactylis, Gram.*†
Delphinium, Ranun.
Digitaria, Gram.*†
Echinops, Compo.
Eleiotis, Leg. P.

* Classical names of plants when transferred from one plant to another on account of resemblance are included in this class.
** Man included.
*† Both convey the same meaning, but the two genera are distinct.

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Elephantopus, Compo.
Erodium, Geran.
Erinocarpus, Til.
Geranium, Geran.
Hæmanthus, Amaryll.
Lagurus, Gram.
Leonotis, Lab.
Leontodon, Compo.
Leonurus, Lab.
Manisuris, Gram.
Mazus, Urti.
Mimusops, Sapot.
Monocera, Til.
Ophiopogon, Hæmo.
Ophiorhiza, Rubia.
Ophiurus, Gram.
Orchis, Orch.
Pardanthus, Irid.
Pedicularis, Scroph.
Pelargonium, Geran.
Pennisetum, Gram.
Phalangium, Lil.
Phrynium, Scit. *
Physalis, Solan.
Pithecolobium, Leg. M.
Plantago, Plant.
Pulicaria, Compo.
Pythonium, Arac.
Ranunculus, Ranun.*
Renanthera, Orchid.
Ricinus, Euphor.
Sauromatum, Arac.
Sauropus, Euphor.
Senecio, Compo.
Tragopogon, Compo.
Tragus, Gram.
Uraria, Leg. P.
Zebrina, Commel.

C.—Names based on a comparison with inanimate objects.

Ardisia, Myrsi.
Aspidistra, Lil.
Balanophora, Bal.
Calathea, Scit.
Calceolaria, Scroph.
Centunculus, Primul.
Cleidion, Euphor.
Cotyledon, Crass.
Crotalaria, Leg. P.
Cyathocline, Compo.
Cyathula, Amarant.
Cypripedium, Orch.
Floscopa, Commel.
Geissaspis, Leg. P.
Gladiolus, Irid.
Gomphia, Ochna.
Gomphrena, Amarant.
Lagenaria, Cucur.
Lecanthus, Urti.
Lonchocarpus, Leg. P.
Lychnis, Caryo.
Nauclea, Rubia.
Nolana, Covol.
Nomismia, Leg. P.
Pedalium, Pedal.
Pedilanthes, Euphor.
Peltophorum, Leg. C.
Pergularia, Scroph.
Phaseolus, Leg. P.
Pilea, Urti.
Scoparia, Scroph.
Scutellaria, Lab.
Scutea, Rham.
Strombosia, Olac.
Thrinax, Palm.
Trapa, Onagr.

III. Names describing Properties and Uses.

Abroma, Stercul.
Acorus, Arai.
Aleurites, Euphor.
Allium, Lil.
Althæa, Malva.
Alyssium, Cruci.
Amblogyne, Amarant.
Amomum, Scit.
Anagallis, Primul.
Antidesma, Euphor.
Argemone, Papaver.
Aristolochia, Arist.
Artemisia, Compo.
Artocarpus, Urtic.
Capsicum, Solan.
Caroxylon, Chenopod.
Clerodendron, Verben.
Conyza, Compo.
Cynanchum, Asclep.
Daucus, Umbel.
Ecbolium, Acanth.
Epaltes, Compo.
Euonymus, Celastr.
Exacum, Gent.
Excæcaria, Euphor.
Fagonia, Zygo.
Flaveria, Compo.
Galactia, Leg. P.
Hippomane, Euphor.
Hyophorbe, Palm.
Ischæmum, Gram.
Jatropha, Euphorb.
Lycopersicum, Solan.
Malva, Malva.
Matricaria, Compo.
Melica, Gram.
Ophelia, Gentian.
Ophioxylon, Apocyn.
Oxalis, Geran.
Panax, Aralia.
Pancratium, Amaryll.
Phalangium, Lil.
Phragmites, Gram.
Piscidia, Leg. P.
Plumbago, Plumb.
Polyalthea, Anon.
Polygala, Polygal.
Potentilla, Rosa.
Psychotria, Rubia.
Pulicaria, Compo.
Pyrethrum, Compo.
Reseda, Resed.
Ruta, Ruta.
Salvia, Lab.
Sapindus, Sapind.
Saponaria, Caryo.
Saxifraga, Saxi.
Scabiosa, Dipsa.
Scoparia, Scroph.
Scorzonera, Compo.
Sechium, Cucur.
Solidago, Compo.
Statice, Plumb.
Symphytum, Borag.
Taraxacum, Compo.
Theobroma, Stercul.
Thespesia, Malva.
Thlaspi, Cruci.
Vatica, Dipter.

* These are properly speaking habitat names.

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IV. Habitat Names.

Ærides, Orchid.
Agrostis, Gram.
Ammobium, Compo.
Anodendron, Apocyn.
Apium, Umbel.
Aponogeton, Naiad.
Arenaria, Caryophyll.
Blyxa, Hydrochar.
Dendrobium, Orchid.
Dendrochilum, Orchid.
Dilivaria, Acanth.
Epidendrum, Orchid.
Episcia, Gesner.
Geophila, Rubia.
Halocharis, Chenopod.
Halopyrum, Gram.
Haloragis, Halorag.
Heleocharis, Cyper.
Heleochloa, Gram.
Helosciadium, Umbel.
Herpestes, Scroph.
Hydriastele, Palm.
Hydrilla, Hydrochar.
Hydrobryum, Podost.
Hydrocotyle, Umbel.
Hydrolea, Hydrophyll.
Hydrophylax, Rubia.
Hydrotrophus, Hydrochar.
Hygrophila, Acanth.
Hygrorhiza, Gram.
Ilysanthes, Scroph.
Limnanthemum, Gentian.
Limnophila, Scroph.
Limnophyton, Alisma.
Limodorum, Orchid.
Limonia, Ruta.
Mariscus, Cyper.
Naias, Naiad.
Nemophila, Hydrophyll.
Neptunia, Leg. M.
Nerium, Apocyn.
Nomaphila, Acanth.
Nymphæa, Nymph.*
Oreodoxa, Palm.
Origanum, Labiat.
Oropefium, Gram.
Oroxylum, Bignon.
Parietaria, Urtica.
Petroselinum, Umbel.
Phrynium, Scitamin.
Pistia, Arac.
Potamogeton, Naiad.
Ranunculus, Ranuncul.
Salicornia, Chenopod.
Salix, Salic.
Salsola, Chenopod.
Typha, Typha.

V. Names connected with Geography.

Aberia, Bixa.
Adenium, Apocyn.‖
Carica, Passifl.†
Citrus, Ruta.
Coffea, Ruta.
Cressa, Convol.
Cydonia, Rosa.
Eleusine, Gram.
Guidia, Thymel.
Heliconia, Scitam.
Howea, Palm.
Iberis, Crucifer.
Lycium, Solan.
Medicago, Leg. P.
Melhania, Stercul.
Moringa, Moring.
Nepeta, Labiat.
Nesæa, Lythr.
Obione, Cheno.
Opuntia, Cact.
Ougeinia, Leg. P.‡
Punica, Lythr.
Sapindus, Sapind.§
Tamarindus, Leg. C.§
Tamarix, Tamar.

VI. Miscellaneous Groups of Descriptive Names.

A.—Names indicating beauty or sweetness.¶

Abelmoschus, Malva.
Agapanthus, Lil.
Asphodelus, Lil.
Bellis, Compo.
Calacanthus, Acanth.
Calanthe, Orchid.
Calliandra, Leg. M.
Callicarpa, Verben.
Callichroa, Compo.
Calligonum, Polygon.
Calliopsis, Compo.
Callistemma, Dipsa.
Callistemon, Myrt.
Callistephus, Compo.
Calonyction, Convol.
Calophanes, Acanth.
Calophyllum, Gutti.
Calosanthus, Bignon.
Calotropis, Asclep.
Charieis, Compo.
Clianthus, Leg. P.
Cosmos, Compo.
Cosmostigma, Asclep.
Dæmonorops, Palm.
Dianthus, Caryo.
Epicharis, Melia.
Eragrostis, Gram.
Eucharis, Amaryll.
Evodia, Ruta.
Gaura, Onagr.
Gloriosa, Lil.
Glycicarpus, Anacard.
Glycine, Leg. P.
Glycosmis, Ruta.
Gratiola, Scroph.
Hedychium, Scitam.
Hedyotis, Rubia.
Hemerocallis, Lil.
Lamprachænium, Compo.
Lychnis, Caryo.
Melica, Gram.
Melilotus, Leg. P.
Meliosma, Sabia.
Mirabilis, Nyctag.
Moschosma, Lab.
Myristica, Myrist.
Myroxylon, Leg. P.
Myrsine, Myrsin.
Nectandra, Laur.
Ocimum, Lab.
Osmanthus, Olea.
Phajus, Orchid.
Phlogacanthus, Acanth.
Phlox, Polemon.
Roupellia, Apocyn.

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* A water-nymph is meant. ‖ After Aden.
† Erroneously so named. ‡ After Ujjain. § After India.
¶ Sweetness refers to sweetness of taste as well as smell.

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B.—Names describing colours.

Argyreia, Convol.
Beta, Chenopod.
Cineraria, Compo.
Coccinia, Cucur.
Cyanophyllum, Melasto.
Cyanospermum, Leg. P.
Cyanotis, Commel.
Erythræa, Gent.
Erythrina, Leg. C.
Flaveria, Compo.
Galanthus, Amaryll.
Leucanthemum, Compo.
Leucas, Lab.
Melaleuca, Myrt.*
Melanthesa, Euphor.
Melastoma, Melasto.**
Ochrocarpus, Gutti.
Ochradenus, Resed.
Rubia, Rubia.
Rubus, Rosa.
Xanthium, Compo.
Xanthosoma, Arac.

C.—Names involving numbers.

Decaneurum, Compo.
Decaschistia, Malva.
Dianthera, Acanth.
Dichoris, Commel.
Dipetalum, Ruta.
Diplachne, Gram.
Dipterocarpus, Diptero.
Dipterygium, Capp.
Enneapogon, Gram.
Haplanthus, Acanth.
Haplophyllum, Ruta.
Heptapleurum, Aral.
Hexacentris, Acanth.
Monechma, Acanth.
Monocera, Til.
Monochoria, Ponte.
Oligomeris, Resed.
Pentapetes, Stercul.
Pentas, Rubia.
Pentatropis, Asclep.
Polyalthia, Anona.
Polyanthes, Amaryll.
Polycarpæa, Caryo.
Polycarpon, Caryo.
Polygonum, Polygon.
Polyzygus, Umbel.
Tetragonia, Ficoid.
Tetrameles, Datis.
Tetranthera, Laur.
Tetrapogon, Gram.
Tetrastigma, Ampel.
Trias, Orchid.
Tribulus, Zygo.
Trigonella, Leg. P.
Tripogon, Gram.
Tristachya, Gram.
Uniola, Gram.

D.—Names involving time.

Calendula, Compo.
Calonyction, Convol.
Eranthemum, Acanth.
Hemerocallis, Lil.
Macronyx, Leg. P.
Mesembryanthemum, Ficoid.
Nyctanthes, Olea.
Primula, Primul.

E.—Names that are depreciative.

Anticharis, Scroph.
Dysophylla, Lab.
Dysoxylum, Melia.
Nasturtium, Cruci.
Phayolopsis, Acanth.
Saprosma, Rubia.

F.—Names bearing incorrect † descriptions.

Bursinopetalum, Corn.
Carica, Passi.
Cirrhopetalum, Orch.
Didymocarpus, Gent.
Dipterygium, Capp.
Holoptelea, Urt.
Madacarpus, Compo.
Plectronia, Rubia.

COMMEMORATIVE NAMES.

I. Commemorative Names derived from History.

Abildgaardia, Cyper.
Adansonia, Malva.
Æginetia, Orobanch.
Albizzia, Leg. M.
Allamanda, Apocyn.
Allmania, Amarant.
Aloysia, Verben.
Alpinia, Zingiber.
Alstonia, Apocyn.
Amherstia, Leg. C.
Ammannia, Lythr.
Anguillaria, Lil.
Arduina, Apocyn.
Asclepias, Asclep.
Averrhoa, Gerania.
Avicennia, Verben.

---

* Black and white may prove a good addition to the cartoons of Black and White Whiskey!

** The black colour is produced in the mouth of one who eats the fruit of *Melastoma*!

† The incorrectness with regard to the descriptive names applies to the Bombay species.

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Baccaurea, Euphorb.
Banisteria, Malpig.
Barleria, Acanth
Barringtonia, Myrt.
Bartonia, Gent.
Bassia, Sapot.
Bauhinia, Leg. C.
Beaumontia, Apocyn.
Begonia, Begon.
Beilschmiedia, Laur.
Bentinckia, Palm.
Benincasa, Cucurbit.
Bergera, Ruta.
Bergia, Elatin.
Berthelotia, Compo.
Bignonia, Bignon.
Billbergia, Bromel.
Bischofia, Euphorb.
Blachia, Euphor.
Blainvillea, Compo.
Bletia, Orchid.
Blighia, Sapind.
Blumea, Compo.
Bocagea, Anon.
Bocconia, Papaver.
Bœhmeria, Urtic.
Bœrhaavia, Nyct.
Bonamia, Convol.
Bonnaya, Scroph.
Bosea, Urtica.
Boswellia, Burser.
Bouchea, Verben.
Bougainvillæa, Nict.
Boussingaultia, Chenopod.
Bragantia, Aristoloch.
Breweria, Convol.
Breynia, Euphorb.
Bridelia, Euphorb.
Bromelia, Bromel.
Broussonetia, Urtica.
Browallia, Solan.
Brownea, Leg. C.
Brugmansia, Solan.
Bruguiera, Rhizo.
Brunfelsia, Solan.
Buchanania, Anacar.
Buchnera, Scroph.
Buddleia, Logan.
Buettneria, Stercul.
Burmannia, Burm.
Butea, Leg. P.

Cæsalpinia, Leg. C.
Calceolaria, Scroph.
Careya, Myrt.
Carludovica, Cyclanth.
Casearia, Samyd.
Castilloa, Urtica.
Catesbæa, Rubi.
Celsia, Scroph.
Cerbera, Apocyn.
Chailletia, Chaillet.
Chamissoa, Amarant.
Christisonia, Orobanch.
Cicca, Euphorb.
Clarkia, Onagr.
Clausena, Ruta.
Clutia, Euphorb.
Cobæa, Convol.
Collinsia, Scroph.
Collæa, Leg. P.
Commelina, Commelina.
Cookia, Ruta.
Cordia, Borag.
Cottonia, Orchid.
Courtoisia, Cyper.
Covellia, Urtica.
Cratæva, Capparid.
Crescentia, Bigon.
Cupania, Sapind.
Cyrilla, Gesner.

Dahlia, Compo.
Dalbergia, Leg. P.
Debregeasia, Urtica.
Deutzia, Saxifrag.
Dieffenbachia, Arac.
Dillenia, Dillen.
Dioscorea, Dioscorea.
Dodonæa, Sapind.
Dombeya, Stercul.
Dorstenia, Urtica.
Dregea, Asclep.
Dumasia, Leg. P.
Dunbaria, Leg. P.
Duranta, Verben.

Ebermaiera, Acanth.
Ehretia, Borag.
Eichhornia, Ponteder.
Ellertonia, Apocyn.
Ervatamia, Apocyn.
Eschscholtzia, Papaver.
Eugenia, Myrt.
Eupatorium, Compo.
Euphorbia, Euphorb.
Fagræa, Logan.
Falconeria, Euphor.
Farsetia, Crucifer.
Fittonia, Acanth.
Flacourtia, Bixa.
Flemingia, Leg. P.
Fleurya, Urtica.
Fluggea, Euphor.
Forskohlea, Urtica.
Frerea, Asclep.*
Fuchsia, Onagr.
Fuirena, Cyper.
Furcræa, Amaryll.

Gaillardia, Compo.
Gaillonia, Rubia.
Galphimia, Malpigh.
Garcinia, Guttifer.
Gardenia, Rubia.
Garnotia, Gram.
Gazania, Compo.
Gerbera, Compo.
Gesneria, Gesnera.
Gibsonia, Polygon.
Gilia, Polymon.
Girardinia, Urtica.
Gisekia, Ficoid.
Gleditschia, Leg. C.
Gloxinia, Gesnera.
Gmelina, Verb.
Goodyera, Orchid.
Gordonia, Tern.
Gouania, Rhamn.
Grangea, Compo.
Grevillea, Protea.
Grewia, Tilia.
Griffithella, Podo.
Griffithia, Rubia.
Grislea, Lythra.
Guatteria, Anona.
Guilandina, Leg. C.
Guizotia, Compo.

Hamiltonia, Rubia.
Hardwickia, Leg. C.
Harworthia, Lil.
Helenium, Compo.
Helmia, Dioscor.
Heritiera, Stercul.
Heuchera, Saxi.
Hewittia, Convol.
Heylandia, Leg. P.
Heynea, Melia.
Hippocratea, Celastr.

* After a previous Governor of Bombay.

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Hiræa, Malpigh.
Hitchenia, Scita.
Hochstetteria, Compo.
Hoffmannia, Rubia.
Holmskioldia, Verb.
Hopea, Diptero.
Hoya, Asclepiad.
Hugonia, Linac.
Hunnemannia, Papav.

Imperata, Gram.
Incarvillea, Bignon.
Iphigenia, Lil.

Jacquemontia, Convol.
Jacquinia, Myrsin.
Johnia, Leg.
Jonesia, Leg.
Josephia, Orchid.
Jussiæa, Onagr.
Justicia, Acanth.

Kæmpferia, Scitam.
Kennedya, Leg. P.
Kleinhovia, Stercul.
Klugia, Gesner.
Knoxia, Rubia.
Kochia, Chenopod.
Kopsia, Apocyn.
Kydia, Malva.
Kyllinga, Cyper.

Lafœnsia, Lythr.
Lagascea, Compo.
Lagerstrœmia, Lythr.
Laggera, Compos.
Lagunæa, Malv.
Laportea, Urtica.
Launæa, Compos.
Lavatera, Malva.
Lawia, Podostemon.
Lawsonia, Lythr.
Lebretonia, Malva.
Ledebouria, Lil.
Leea, Ampelid.
Leersia, Gram.
Legendrea, Convol.
Lettsomia, Convol.
Lindenbergia, Scroph.
Linociera, Olea.
Lippia, Verben.
Livistona, Palm.
Lobelia, Lobel.
Lochnera, Apocyn.
Lonicera, Caprifol.
Ludwigia, Onagrac.
Luisia, Orchid.
Lumnitzera, Combrt.

Macadamia, Protea.
Magnolia, Magnol.
Malcolmia, Cruci.
Manettia, Rubia.
Mappia, Olac.
Maranta, Scitmin.
Marsdenia, Asclep.
Martinezia, Palm.
Martynia, Pedal.
Maurandia, Scroph.
Maurandya, Scroph.
Mengea, Amarant.
Mesua, Gutti.
Merremia, Convol.
Meyenia, Acanth.
Michelia, Magnol.
Mikania, Compos.
Miliusa, Anon.
Millettia, Leg. P.
Millingtonia, Bigno.
Monetia, Salva.
Monniera, Scroph.
Monsonia, Geran.
Montanoa, Compo.
Moricandia, Cruci.
Morinda, Rubia.
Muehlenbeckia, Polygon.
Muldera, Piper.
Murraya, Ruta.
Musa, Scitam.

Nægelia, Gesner.
Nelsonia, Acanth.
Nicandra, Solan.
Nicotiana, Solan.
Nimmoia, Lythr.
Nimmonia, Melia.
Noronhia, Olea.
Notonia, Compo.

Oldenlandia, Rubia.
Osbeckia, Melast.

Palmia, Palm.
Parkia, Leg. M.
Parkinsonia, Leg. C.
Parmentiera, Bignon.
Parsonsia, Apocyn.
Pavonia, Malva.
Pellionia, Urtica.
Pereskia, Cact.
Petrea, Verben.
Phelipæa, Orobanch.
Pierardia, Euphorb.
Pisonia, Nyctagin.
Pitcairnia, Bromel.
Pluchea, Compo.
Plumeria, Apocyn.
Poinciana, Leg. C.
Poinsettia, Euphorb.
Poivrea, Combert.
Pollinia, Gram.
Pontederia, Ponteder.
Pouzolzia, Urtica.
Prestonia, Apocyn.
Prinsepia, Rosa.
Pritchardia, Palm.
Pueraria, Leg. P.

Radermachera, Bignon.
Randia, Rubia.
Rauwolfia, Apocyn.
Reinwardtia, Lin.
Remusatia, Aroid.
Riedleia, Stercul.
Rivea, Convol.
Rivina, Phytolac.
Rondeletia, Rubia.
Rothia, Leg. P.
Rottbœllia, Gram.
Rottlera, Euphorb.
Rudbeckia, Compo.
Ruellia, Acanth.
Rungia, Acanth.
Ruppia, Naiad.
Russelia, Scroph.

Sageretia, Rhamn.
Saintpaulia, Gesner.
Salomonia, Polygal.
Salvadora, Salva.
Sanchezia, Acanth.
Sansevieria, Hæmo.
Schleichera, Sapind.
Schotia, Leg. C.
Schrebera, Olea.
Schweinfurthia, Scroph.
Sebaea, Gent.
Sebastiana, Euphor.
Seddera, Convol.
Seetzenia, Zygo.
Senebiera, Cruci.
Senra, Malva.
Shorea, Diptero.
Shutereia, Convol.
Shuteria, Leg. P.
Siegesbeckia, Compo.
Sinningia, Gesner.
Slevogtia, Gent.

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Smithia, Leg. P.
Solandra, Solan.
Sonneratia, Lythr.
Splitgerbera, Urtica.
Sponia, Urti.
Stapelia, Asclep.
Stephania, Meni.
Sutera, Scrophu.
Swertia, Gentian.
Swietenia, Melia.

Tabernæmontana, Apocyn.
Taverniera, Leg. P.
Thevetia, Apocyn.
Thunbergia, Acanth.
Thunia, Orchid.
Tillæa, Crasul.
Torenia, Scroph.
Tournefortia, Borag.
Tradescantia, Commel.
Tragia, Euphor.
Trevesia, Aralia.
Trewia, Euphor.
Triumfetta, Tilia.
Turnera, Turner.
Turpinia, Sapind.
Turræa, Melia.
Tydæa, Gesner.

Vahlia, Saxifrag.
Vallisneria Hydrochar.
Vandellia, Scroph.
Vateria, Dipter.
Vernonia, Compo.
Veronica, Scroph.
Vicoa, Compo.
Victoria, Nymph.*
Vigna, Leg. P.
Villarsia, Gentian.
Villebrunea, Urti.
Vittadinia, Compo.
Vogelia, Plumbag.
Volkameria, Verben.

Wahlenbergia, Campa.
Wallichia, Palm.
Wallrothia, Verben.
Waltheria, Stercul.
Washingtonia, Palm.
Webera, Rubia.
Wedelia, Compo.
Wendlandia, Rubia.
Wigandia, Hydrophyll.
Wisnera, Alisma.
Wistaria, Leg. P.
Withania, Solan.
Wolffia, Lemna.
Wollastonia, Compo.
Woodfordia, Lythr.
Woodrowia, Gram.†
Wrightia, Apocyn.

Ximenia, Olac.

Zannichellia, Naiad.
Zanonia, Cucur.
Zapania, Verb.
Zehneria, Cucurbit.
Zinnia, Compo.
Zornia, Leg. P.
Zoysia, Gram.

II. Commemorative Names derived from Mythology.

Achillea, Compo.
Ægle, Ruta.
Aglaia, Melia.
Atalantia, Ruta.
Baccaurea, Euphor.
Centaurea, Compo.
Dianella, Lil.
Erythea, Palm.
Euryale, Nymph.
Feronia, Ruta.
Heracleum, Umbell.
Naias, Naiad.
Nephthytis, Ara.
Neptunia, Leg. M.
Nymphæa, Nymph.
Oberonia, Orchid.
Salacia, Calastrin.
Sterculia, Stercul.
Tagetes, Compo.
Tithonia, Compo.
Typhonium, Araceæ.

THE GENERIC NAMES DERIVED FROM THE COMMON NAMES OF PLANTS.

I. Names taken from Greek or Latin Plant Names.

Abutilon, Malva.
Arum, Arac.
Arundo, Gram.
Astragalus, Leg. P.
Atriplex, Cheno.
Cardamine, Cruci.
Carum, Umbel.
Caryota, Palm.
Cassia, Leg. C.
Ervum, Leg. P.
Ficus, Urt.
Fragaria, Rosa.
Glinus, Ficoid.
Gossypium, Malva.
Hyacinthus, Lil.
Laurus, Laur.
Malope, Malva.
Myrtus, Myrt.
Papaver, Papaver.
Paspalum, Gram.
Peganum, Zygo.
Phalaris, Gram.
Piper, Piper.
Pisum, Leg. P.
Poa, Gram.
Prosopis, Leg. M.
Portulaca, Portu.
Rheum, Polygon.
Rosa, Rosa.
Sapium, Euphor.
Scilla, Lil.
Serissa, Rubia.
Solanum, Solan.
Sonchus, Compo.
Thymus, Lab.
Triticum, Gram.

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*After the late Queen-Empress Victoria.

† After G. Marshall Woodrow, late Professor of Botany, College of Science, Poona.

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II. Names taken from Arabic or Persian.

Abelmoschus, Malva.
Ærua, Amaran.
Alhagi, Leg. P.
Aloe, Lil.
Arnebia, Borag.
Azadirachta, Melia.
Cadaba, Cappar.
Calamus, Palm.
Capparis, Cappar.
Carthamus, Compo.
Cicer, Leg. P.
Cinnamomum, Laura.
Costus, Scitamin.
Curcuma, Scitamin.
Cuscuta, Convol.
Dæmia, Asclep.
Dinebra, Gram.
Dobera, Salva.
Doronicum, Compo.
Jasminum, Olea.
Lablab, Leg. P.
Limonia, Ruta.*
Luffa, Cucurbit.
Mærua, Cappar.
Mæsa, Myrsin.
Melochia, Stercul.
Orygia, Ficoid.
Oryza, Gram.
Puneeria, Solan.*
Rhazia, Apocyn.
Santalum, Santal.
Senna, Leg. P.
Sesbania, Leg. P.
Sophora, Leg. P.
Suæda, Chenopod.
Tamarindus, Leg. C.
Themeda, Gram.
Tiaridium, Borag.
Urginea, Lil.
Zizyphus, Rhamn.

III. Names derived from the Indian Languages.

Alangium, Corna.
Belamcanda, Irid.
Bidaria, Asclep.
Canavalia, Leg. P.
Cannabis, Urt.
Canscora, Gentian.
Cansjera, Olac.
Carallia, Rhizo.
Caralluma, Asclep.
Carissa, Apocyn.
Chirita, Gesner.
Congea, Verben.
Datura, Solan.
Dopatrium, Scroph.
Embelia, Myrsine.
Entada, Leg. M.
Galedupa, Leg. P.
Harpullia, Sapind.
Holigarna, Anacard.
Ixora, Rubia.
Kandelia, Rhizo.
Luvunga, Ruta.
Methonica, Lil.
Momordica, Cucurbit.
Mukia, Cucurbit.
Naravelia, Ranun.
Naregamia, Melia.
Nelumbium, Nymph.
Ottelia, Hydrochar.
Pajanelia, Bignon.
Paritium, Mal.
Pavetta, Rubia.
Pithecolobium, Leg. M.‡
Pothos, Aroid.
Putranjiva, Euphor.
Saccharum, Gram.§
Sonerila, Melastom.
Tectona, Verben.
Toddalia, Ruta.

IV. Names of a Vernacular Origin other than Indian or Arabic.

Amoora, Melia.
Ananas, Bromel.
Angelonia, Scroph.
Angræcum, Orchid.
Anona, Anona.
Antiaris, Urtic.
Araucaria, Conifer.
Areca, Palm.
Azima, Salvador.
Bambusa, Gram.
Basella, Chenopod.
Batatas, Convol.
Bixa, Bixa.
Cajanus, Leg. P.
Cananga, Anon.
Canarium, Burser.
Caraguata, Bromel.
Carapa, Melia.
Chavica, Piper.
Chickrassia, Melia.
Chukrasia, Melia.
Cichorium, Compo.
Cipadessa, Melia.
Codiæum, Euphor.
Cortaderia, Gram.
Couroupita, Myrt.
Erycibe, Convol.
Fatsia, Aral.
Gnetum, Gnet.
Guaiacum, Zygoph.
Guarea, Melia.
Guazuma, Stercul.
Hevea, Euphor.
Hura, Euphor.
Jacaranda, Bignon.
Jambosa, Myrt.
Kalanchoe, Crassul.
Kigelia, Bignon.
Lansium, Melia.
Latania, Palm.
Licuala, Palm.
Litsea, Laur.
Maba, Eben.
Macaranga, Euphor.
Manihot, Euphor.
Moacurra, Euphor.
Modecca, Passifl.
Mucuna, Leg. P.
Mukia, Cucurbit.
Nandina, Berber.
Nopalea, Cact.
Ophiopogon, Hæmo.†
Pachira, Malva.
Pandanus, Pandan.

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* *Cf. limbu* and *panir* which are so familiar in Bombay.
‡ A Malabar name translated.
§ Derived from Latin; the Sanskrit name is like the Latin one.
† The Translation of a Japanese name.

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Palaquium, Sapot.
Parinarium, Rosa.
Petunia, Solan.
Pinanga, Palm.
Protium, Burser.
Pupalia, Amarant.
Ravenala, Scit.
Remirea, Cyper.
Rourea, Connar.
Saraca, Leg. C.
Sopubia, Scroph.
Sorghum, Gram.
Tacca, Tacca.
Talinum, Portulac.
Tarenna, Rubia.
Tecoma, Bignon.
Tiliacora, Menisp.
Vangueria, Rubia.
Wagatea, Leg. C.
Walsura, Melia.
Zerumbet, Scit.

APPENDIX.

Names with a Doubtful or Obscure Meaning.

Anamirta, Meni.
Arenga, Palm.
Asystasia, Acanth.
Avena, Gram.
Borago, Borag.
Bupleurum, Umbel.
Caladium, Aroid.
Cipura, Irid.
Cucumis, Cucur.
Debregeasia, Urti.
Dipcadi, Lil.
Emilia, Compo.
Ethulia, Compo.
Freesia, Irid.
Jacobinia, Acanth.
Karatas, Bromel.
Kedrostis, Cucur.
Machilus, Laur.
Odina, Anacard.
Pharbitis, Convol.
Ravenia, Ruta.
Rhoeo, Commel.
Sesuvium, Ficoid.
Talauma, Magnol.

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REVIEWS.

THE BEETLES OF THE HIMALAYAS.

BY

E. A. D'ABREU.

Published by Thacker Spink & Co., Colcutta and Simla, Price Rs. 2.

A small volume of 70 pages, in which is set forth a semi-popular account of the beetles with special reference to the more striking forms found in Darjeeling. In preparing such a volume, intended mainly for schoolboys, one would make the leading idea the provision of interesting nature notes on the commoner beetles, with very carefully selected summaries of habits on groups. In such small space, so little can be given that all turns on judicious selection. The volume fails from the point of view of interest; it will perhaps enable the collector to group his specimens, to name some of them and to get a general idea of classification. Much space is wasted in giving references to papers in scientific journals such as *Ann. Soc. Ent. Belge.*, and the like, which can be of no possible use to any one but an advanced amateur or a professional entomologist. The volume is well produced and illustrated by excellent line figures; many of the commoner species of the hills are easily recognisable and the author has an intimate first-hand knowledge of his subject. Twelve pages are devoted to methods of collecting, pinning, storing, etc., and this section is of special value.

So far as we are aware this book is the first of its kind for India and the only one, dealing with a group of insects, within reach of a schoolboy's pocket. No other group but the beetles lends itself to this treatment in India and Mr. D'Abreu is to be congratulated on his enterprise and devotion to his subject. The volume will stimulate an interest in nature and should be accessible to every schoolboy in the hills.

H. M. L.

BIG GAME SHOOTING IN UPPER BURMA.

BY

SYDNEY A. CHRISTOPHER.

Mr. Christopher commences with a series of introductory chapters.

Attention is drawn to the inadequate amount of literature on shooting in Burma.

The first eight chapters are devoted to choice of rifles and guns, Shikar costume, preliminary considerations, etc., the exhaustiveness of which prepare the reader for a pleasingly full account of the Big Game of the Province. But having once got into the book, on this point, one is disappointed. Eleven chapters (nearly a third of the volume) describe the author's various adventures in obtaining his 1st, 2nd, 3rd, 4th and 5th tigers.

There are three interesting chapters dealing with the little known *Rhinoceros sumatrensis*. We cannot agree with Mr. Christopher in comparing the tracks of a Rhino, with those of a small Elephant, and although rare, the occurrence, "which he appears to doubt," in Lower Burma of *Rhinoceros sondaicus* is well authenticated.

We should like to have found fuller accounts of the other Big Game usually thought of in connection with Shikar in Burma such as the Tsine, Thamin, Burmese Sambhar, etc.—while Serow, Goral, Tapir and Clouded Leopard are not mentioned at all.

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Of bears only the small *Ursus malayanus* is noticed although *Ursus torquatus* has a much more southern range than in India.

Mr. Christopher is to be congratulated on not dragging in "caudal vertebræ" and otherwise attempting to distinguish between the leopard and the panther, although we are amused at his classing those who have previously done so as "Natural History Authors."

In conclusion the author trusts that the accounts of his adventures will be of some use to the beginner and though his advice and "tips" would hold equally good for any kind of hunting in any kind of country, and have been fully written on many times before, we fully endorse everything on such subjects as "care in handling a gun" as useful and sound. But for the sportsman who has hunted elsewhere and wishes to learn about the distribution and habits of the local Big Game of Burma previous to going there, this book will be found too incomplete to be of any great value. We are sure Mr. Christopher does not seriously suggest sitting up for game over water holes and salt licks.

The illustrations, although numerous, are poorly reproduced and being in themselves of small interest might with advantage have been left out.

G. C. S.

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ROLL OF HONOUR.

Lieut.-Colonel Herbert Hastings Harington was born at Lucknow on the 16th January 1868; the son of Mr. Herbert Harington of the Oudh Commission. Educated at Malvern he entered the Militia and in 1888 was gazetted a subaltern in the Welsh Regiment.

Two years later he was appointed to the Indian Staff Corps and joined the 92nd Punjabis with whom he served for over 20 years in Burmah, and in this country also he for 5 years was attached to the Burmese Police.

In December 1914 he was promoted to Lieut.-Colonel, and in February 1916 was gazetted to the command of the 62nd Punjabis, and it was whilst leading this Regiment into action in Mesopotamia that he was killed on the 8th March.

In 1909 Colonel Harington married Dorothy, the youngest daughter of the Hon. Walter Pepys, by whom he had a son and two daughters.

Colonel Harington had always been a keen lover of Nature and Natural History generally, but it was not until he went to Burmah that he really took up Ornithology seriously.

His first articles were written for the "Rangoon Gazette" and soon attracted notice on account of the careful and accurate observation they displayed. These articles he reproduced in book form in 1908-9 adding a valuable table shewing the distribution of Burmese birds.

He also contributed articles from time to time to the "Ibis," Bombay Natural History Journal, and other periodicals of which the most important was his review of the Timeliidae appearing in the Bombay Journal during 1914-15.

Colonel Harington was the discoverer of a number of new forms and several birds have been named after him by various ornithologists in recognition of the good work he did. Amongst these may be mentioned *Polionetta haringtoni* (Oates); *Oreicola f. haringtoni* (Ogilvie-Grant); *Pomaterhinus e. haringtoni* (Stuart Baker) and *Garrulus haringtoni* (Sharpe).

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MISCELLANEOUS NOTES.

No. 1.—HYÆNA DRIVING PANTHER AWAY FROM ITS KILL.

As the following account of a hyæna appropriating the 'kill' of a panther and keeping the panther off it too, sent me by an old and experienced shikari may be of interest, I send the narrator's own account of the occurrence. "A panther killed my tie-up and would you believe it, a hyæna turned up and kept the panther off; whom I could see sitting a long way off and waiting. He tried to speak up now and again, but the hyæna used to drive him off. I lost the panther as I let many chances go of a good shot at him simply through looking on at the fun. Eventually I wounded him very badly but did not get him. He was a very big brute and I was very amused at him fearing a wretched hyæna. There was a tiger there, but I never got a chance at him." On this, thinking he might have been deceived by the light in mistaking the tiger for the hyæna, I wrote and asked him. His reply is quoted, "I write to dispel the suspicion you seem to have that a hyæna could drive a leopard off a kill. There is not the shadow of a doubt in my mind. It was full moon and the kill was on a spot as bare as the palm of my hand and not more than 10 yards from my machan. The hyæna turned up first and walked round and round the kill, at times within 5 yards of the machan. He kept growling or rather whining and looking in one direction where there were a lot of bushes. I could see his very stripes, in fact, almost as well as in daylight. After a time he started at the 'kill' but only took a bite or two and then used to march off towards this clump of bushes and holding his head up, sort of half barked and half moaned. The shikari with me was very amused and thought the brute was in a funk of the panther turning up. After a few more bites he again took a few strides towards those bushes but in a more determined manner, then the shikari pointed out the panther sitting at the edge of the clearing and looking on. The hyæna was fully half an hour at the kill, whilst the panther could be plainly seen sitting on the one spot. The old hyæna did not worry much; kept on having a few bites and walking towards the leopard, growling at him. He never went close up. Then the hyæna got a tremendous junk out of the inside of the kill in his mouth and walked off. No sooner the leopard saw this than he came trotting up to the kill. The hyæna promptly dropped his junk of meat and came running back. The panther was then right on the kill and seemed inclined to dispute it, but when the hyæna walked up to within a couple of yards of him, he bounded off and sat down some way off. The hyæna started at the kill again and it was at this moment I plugged at the leopard. He rolled about and growled but picking himself up disappeared. The hyæna was not much frightened and simply trotted off. Ten minutes later he was round again quite unconcerned and I am ashamed to say I plugged and missed him.

The shikari with me said he knows of cases where leopards have given way to hyænas. It has always been puzzling to me why I have never come across a hyæna killed by a panther. In Bundelkhand, hyænas infest the places where panthers are common and if the panther did not fear a hyæna, I am sure the latter would easily have been exterminated by now. There is no mistaking a tiger for a hyæna which has such a distinctive shape and walk, besides as I tell you it was like daylight and the kill was right under my tree and this beast was there over half an hour.

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I could have told a tiger even by quarter moon had he been at the kill so you can safely take it from me—there is not the shadow of a doubt that it was a hyæna."

DALTONGUNG, 16*th August* 1916. F. FIELD.

[In Volume XIX of our Journal at page 518, Capt. R. C. Burke described a fight between a Hyæna and a Panther over a 'kill,' in which the Panther was driven off by the Hyæna.—EDITORS.]

No. II.—AN ALBINO TIGER FROM THE CENTRAL PROVINCES.

I have just had the opportunity of examining the skin of an albino tiger from the Central Provinces; it was killed about six years ago in the Pendra Zamindari of the Bilaspur District. This skin with the paws cut away is piped with green flannel and mounted with the head raised and the mouth open. It measured from nose to tail 7 feet 6 inches, of which the tail only measured 2 feet 6 inches, but this has probably been shortened by the dresser as it was not intact near the root. The narrowest part across the skin measured 2 feet 8 inches. It was cream coloured throughout but paler on the head and the stripes were chocolate brown. The fur was rather long and soft in texture; its whiskers, of which only three remained were dark-brown and white. It is still in fairly good condition except for a few small bare patches on the face and behind the ears. The animal had been shot by an uncle of the owner (Syed Anwar Padsha, Revenue Inspector, Seoni Chhapara, C. P.) who brought it to the museum with a hope of disposing of it and my object of putting this in the journal is merely to put the fact on record and to give any would-be purchasers of such curiosities an opportunity.

CENTRAL MUSEUM, NAGPUR. E. A. D'ABREU, F.Z.S.
1*st May* 1916.

[In Volume XIX of this Journal a white tiger was recorded from Orissa and the other occurrences on record were also given.—EDS.]

No. III.—NOTES ON THE BURMESE FERRET-BADGER (*HELICTIS PERSONATA*).

The distribution of this species in Blanford's Mammalia is given as Pegu, Manipur and Cachar. It is however to be found in the Bhutan Duars; where owing to its nocturnal habits, it is probably not quite so rare as it appears to be.

During the day it resides chiefly in burrows, excavated by itself. A favourite situation for these burrows being the sides of a drain or under a tree; I have also taken it in grass land. The usual number of young in a litter is three; these are born blind in the burrows, generally in the month of June, and show the same pattern of colouration as the adults. I have been unable to ascertain the time required for the young to open their eyes. In two where I tried this, I kept the young on one occasion for ten days and in the other for a fortnight, but in neither case did the eyes show any signs of opening. This may have been possibly due to an unsuitable diet.

A few years ago I saw what appeared to me to be an undoubted skin of *Helictis orientalis*, the brown Ferret-badger, in a friend's bungalow some twelve miles west of this garden, on the other side of the Toorsa river. Since then I have been constantly on the look out for this species here, but have failed to find one in this District. So it is just possible that the dividing line between these two species may prove to be the Toorsa river.

HASIMARA T. E., H. V. O'DONEL.
BHUTAN DUARS, 18*th July* 1916.

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No. IV.—FLYING SQUIRREL'S NESTS.

I noticed with interest Mr. Crump's note on *Pteromys alboniger*, in Report No. 23 on the Society's Mammal Survey (Vol. XXIV, p. 486 of the Journal). I have several times seen the nests of flying squirrels, but only of *Petaurista*, sp. The Chins told me that of this genus, the females and young live in nests, and the males among the branches of thickish trees, during the hot and cold weather; during the rains, as a rule, they all go into holes in trees, often using an old "bear-bite". *Pteromys* sp. are said to live in holes always. My experience has borne this out; I have caught *Pteromys* sp. in a hole in a tree in the cold weather, and have heard of two or three others caught in the same situation by reliable Burmans, as well as Chins. I have shot (1) a male *Petaurista candidulus* (?) in the Chin Hills (my No. 335) at 9 a.m. on 26th April 1915, sleeping among the branches of a thickish evergreen tree (a rhododendron, as far as I remember), (2) a female and one young one (*P. candidulus*) from a nest within 50 yards of my camp, in February, and (3) a second female (*P. candidulus*) in March from a nest farther off, both about 6 miles west of Kindat: and I was shewn the nest from which the two specimens of *Petaurista sybilla* (♀ & juv.) were caught. On the other hand I saw a pair of *Petaurista candidulus* in August 1912, which I did not shoot, coming out of a hole high up in a teak tree, at dusk. The nests have been different from those of *Ratufa* sp., in that they are larger and more open. *Ratufa* builds a solid structure, while *Petaurista* builds a strong but more 'basket like' arrangement. In the nest near my camp referred to above, I think I could see the owners sleeping during the day, through the walls: the nest was in dense shade, and there were dried leaves in its walls, so I cannot be certain. The differences in the nest used by the two genera may be due to *Petaurista* using old *Ratufa* nests, but I am inclined to agree with the Chins in thinking that they make their own. This is farther borne out by dried leaves being sometimes seen attached to the sticks forming the walls, though these may be repairs.

These notes refer only to the Chin Hills and the Upper Chindwin Division, and are curious in showing a difference in habits in Sikkim.

J. M. D. MACKENZIE.

PEGU, BURMA, 21*st July* 1916.

No. V.—NOTE ON *EPIMYS BOWERSI*, AND., ETC.

On page 410 of Vol. XXIV of the Society's journal, Mr. Oldfield Thomas says, under '*Epimys bowersi*, And., "one example was also obtained by Mr. S. F. Hopwood in 1913, at Kindat itself." May I point out that this is not quite correct. The specimen was obtained by Mr. J. C. Hopwood and was *labelled* Kindat, although it was actually obtained in the Chin Hills, about 50 miles west of Kindat. It was brought down by a Chin forester, and I was staying with Mr. Hopwood at the time, so I am sure my information is correct. It is a somewhat important detail of distribution, as I think I was unable to get specimens of the *E. bowersi* group East of the Kabaw Valley (*i.e.*, I only got them in the Chin Hills). I saw several large holes said to be made by these rats in the area, but I think was unable to get specimens.

The name of the village where the types of *Epimys mackenziei* and *Petaurista sybilla* were collected is Haingyan; *Epimys manipulus* type comes from Kampat.

J. M. D. MACKENZIE.

PEGU, BURMA, 16*th July* 1916.

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No. VI.—NIDIFICATION OF THE GOLDEN WEAVER-BIRD (*PLOCEËLLA JAVANENSIS*).

When on tour in the Sittang delta (June 30th to July 4th) I found *Ploceëlla javanensis* breeding in considerable numbers. As some of the notes I made differ considerably from those in Humes 'Nests and eggs of Indian birds', I am sending them to you in case you care to use them. They were mostly made in and round the village of Yitkangale, 16 m. S. E. of Pegu. The nests were placed from 3 to 12 feet from the ground, generally about 8 or 10 feet. They were mostly built in a thorny bush, locally called 'Kathit,' at the extremities of the branches, supported by the twigs being worked into their structure: the support came indiscriminately from above, below, or all round the nest. I found a few nests (mostly unfinished) in elephant grass, but 80 per cent. were in small trees or bushes.

In all cases, the bird had apparently exercised care in the selection of the site. All colonies found in trees (with the exception of 5) were in Kathit or Zee, both of them thorny, and most unpleasant to deal with. Of the 5 exceptions, 4 were built in thornless trees, which contained hornet's nests, and the fifth was in a tree infested by a very large ant with a fearsome bite. My man had a badly swollen hand as the result of getting eggs from the last colony.

I found one or two clutches of three eggs, say 5 per cent., but the great majority were of two only. The nest reminds one more of that of a Munia than a *Ploceus*.

In grass, I only found 3 or 4 nests together, but in trees the colonies numbered up to 12 or 15 nests, usually 8 or 10. I found 3 or 4 nests containing young, but the greater number contained quite fresh eggs; in some, laying had not been commenced.

PEGU, BURMA, *6th July* 1916. J. M. D. MACKENZIE.

No. VII.—THE EASTERN BAYA (*PLOCEUS MEGARYNCHUS*) NESTING IN THE SAME TREE AS THE JUNGLE BEE (*APIS INDICUS*).

I send you a photo taken by myself of a hive of the Jungle bee *Apis indicus* with the nest of the Eastern baya *Ploceus megarynchus* along side of it. This is the third instance I have come across. Can you let me know whether it has been observed before?

HASIMARA P. O., DUARS, *22nd June* 1916. H. V. O'DONEL.

[The photograph is unfortunately not capable of being reproduced.—EDITORS.]

No. VIII.—THE PIED CRESTED CUCKOO (*COCCYSTES JACOBINUS.*)

The Pied Crested Cuckoo, as is well known, usually deposits its egg which is hedge-sparrow blue, in the nest of a Babbler.

The Common Babbler *Argya caudata* and the Jungle Babbler *Crateropus canorus*, both of which lay blue eggs, are the Babblers usually selected as foster-parents in this neighbourhood.

On the 15th July I was surprised to find an undoubted egg of this cuckoo in a nest of the Common Bulbul *Molpastes bengalensis*. The nest contained three eggs of the Bulbul in addition to the Cuckoo's egg. All were hard set.

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I do not know if the fact of this Cuckoo parasitising birds laying other than blue eggs has been previously recorded.

DEHRA DUN, 15th *August* 1916. B. B. OSMASTON, I.F.S.

No. IX.—SAPSUCKERS IN THE U. S. A.

In connection with Mr. A. E. Osmaston's note in this Journal, Vol. XXIV, pp. 363-6, it may be of interest to note that the work of woodpeckers with which he deals, is of very common occurrence in the U. S. A., both east and west if my memory serves me correctly. The holes are always referred to as made by 'sapsuckers,' though the average woodsman cannot always distinguish the birds responsible from the strictly insectivorous woodpeckers. There, too, a large variety of tree species is attacked including *Cornus*, sp. and *Pyrus*, sp. (*e.g.*, the cultivated apple and pear trees), as well as various oaks, maples, etc. The subject has been studied by the U. S. Biological Survey, which has issued a bulletin on it; unfortunately I have not yet seen it, but I can quote the following remarks taken from it, from a letter recently received from a friend in the U. S. Forest Service: "Three members of the (woodpecker) group, the only ones properly known as sapsuckers, are injurious, since their chief purpose in digging into trees is to secure the cambium and sap for food. Altogether the damage done by sapsuckers in the United States amounts yearly to not less than $1,200,000. The three species referred to are, the Yellow-bellied Sapsucker (*Sphyrapicus ruber*), the Williamson Sapsucker (*S. thyroides*), and the Red-throated Sapsucker (*S. varius nuchalis*)."

W. ALMORA DIVN., *May* 1916. H. G. CHAMPION, I.F.S.

No. X.—OWL CAUGHT ON A THORN.

A few days ago whilst birds-nesting in a ravine near Dehra Dun, I disturbed a Scops Owl which was sitting in a small tree over which the prickly climber (*Cæsalpinia sepiaria*) was spreading. The owl in its flight accidentally collided with one of the dry, curved, leafless branchlets of the creeper which is armed throughout its length at intervals of from ½ to ¼ inch with short recurved spines, mostly in pairs. To my surprise the owl remained fluttering and suspended from the spiny twig from which I had considerable trouble in extricating it. It had been caught by the eyelids by at least two thorns both above and below the eye and so securely that I think it improbable that it would have managed to effect its escape unaided. The bird proved to be *Scops bakkamœna* (the Collared Scops Owl). I kept it a few days in captivity, feeding it on cockroaches, and then allowed it to escape.

DEHRA DUN, 15th *August* 1916. B. B. OSMASTON, I.F.S.

No. XI.—THE NESTING OF THE RAIN QUAIL (*COTURNIX COROMANDELICA*) IN THE CENTRAL PROVINCES.

Many thanks for your letter in regard to the nesting of the Black-breasted or Rain Quail (*Coturnix coromandelica*). The "closed" season for this bird in the Central Provinces is from May 1st until November 30th. I have always been of an opinion that these dates are open to correction. Would you therefore kindly give me your opinion on the subject after perusing the following observations and comments. Before continuing, I might add that

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I have had rather exceptional opportunities of observing the habits of these birds, my work involving the traversing of a large area of grass land in the C. P. yearly.

The Rain Quail pair preparatory to nesting in the latter half of February. By the middle of March, sometime before, should the hot weather be advancing prematurely, nests are to be found. These are generally in the grass, bounding watery nullahs. The chicks are about in the early part of April and by the time the monsoon has set in (first or second week in June) the chicks are big enough to withstand the torrential rain. As soon as the rains diminish in September, the parent birds nest again, chicks being about early in October.

The possession of a good pointer enabled me to make the foregoing observations with some degree of accuracy. I had this dog for eleven seasons in India. Instead of flushing a quail out of hand and scattering a brood, this dog would "stand" to any quail she found. She stood to quail on nests when taken for runs over the grass lands during the nesting season. The bird would sit within a foot of her nose and I, on several occasions, walked quietly up behind the dog and observed the bird on the nest. I found a quail never rose directly from the nest, but always ran several yards before rising. The dog would occasionally find broods and "stand" to them. At first I thought the dog was playing the fool as there was apparently no bird in front of her, but one day I accidentally stamped on a chick after forcing the dog on. This led me to investigate some of these mysterious "points." I soon discovered very small chicks sitting absolutely rigid. When turned over on their backs they never moved, but as soon as one withdrew they disappeared very quickly. The chicks were marked with the usual game bird chick marking. The nests and broods were all found always in the seasons previously mentioned.

When the monsoon had broken, the grass being about six inches high, scent good and the weather cool, I always used to take the pointer puppies out with the old dog to train on quail. Cover was not too thick and the spring broods were full grown. Never did I find a nest at this season of the year, only well grown birds fit to shoot. Judging by the quantities all these quail could not have been bred locally. I should think that a good number were migratory birds, spring birds coming up from Southern India, when the rains became too heavy and proceeding probably into Rajputana later on. This is, of course, purely conjecture, but there are certainly more quail on the grass lands during the month of July, than were ever bred there. One officer told me that he killed fifteen brace in one evening on the cavalry parade ground at Jubbulpore. Birds in such quantities cannot be breeding.

Under the circumstances I suggest that quail shooting should close on March 1st at the latest and reopen again on July 1st for a period of two months, then remain closed until the 30th of November. This would give opportunities for a little shooting at a season when there is little sport to be had. As the quail do not nest in large quantities locally, the parent bird I believe, would not suffer much, as it is the young birds, new to flight and easily flushed, that afford the sport.

J. A. BUDDEN, CAPT.,
Military Farms Department.

SAUGOR, C.P., 28*th August* 1916.

[According to Hume and Oates, the Rain Quail nests in Northern India in June and July and in the Deccan in August and September. We fear that it might be difficult if Capt. Budden's suggestions were adopted to get sportsmen to remember the dates when the rail quail could be shot and when they were protected.—EDITORS.]

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No. XII.—BREEDING OF THE BANDED CRAKE (*RALLINA SUPERCILIARIS*).

The *Fauna of British India* says about this bird :—" Its summer quarters and breeding haunts are unknown .....Nothing certain is known of the nidification." Since this was written, however, Mr. T. R. Bell and Major Betham have found nests of this Crake near Poona and Karwar respectively, and have given detailed descriptions of the nests and eggs on pages 180, 393 and 813 of Vol. XIV of this Journal.

So far as I am aware no one has reported the bird as breeding north of Bombay, so that an account of a nest found recently by me near Dehra Dun will perhaps be of interest.

On July 10, while exploring a small nala about a mile from Dehra, full of exceedingly dense jungle consisting of various shrubs and brambles, I came on a nest of this bird in the middle of a low thick bush. The nest was 4 feet from the ground, composed of dead leaves and a few sticks with a slight depression in the centre. The bird was sitting on the nest.

On my advancing my hand in the direction of the nest, the bird, instead of making off, stood up on the nest puffed out her feathers and pecked viciously at my hand. Having done this, she sat down again on the eggs. I again put out my hand, with the same result, and this was repeated several times, the bird refusing to leave her eggs. I then pushed my hand under her, while she stood up and delivered a series of good hard pecks which were not altogether pleasant. I took 4 eggs from under her and having examined them, returned 2, leaving her sitting on the remaining 5 eggs.

When I got home, finding that the nidification of this bird was not recorded in the *Fauna of British India*, I decided to take the remaining eggs, which I did in the following day, though I was very loth to do so, after the extraordinary bravery displayed by the parent bird. On my second visit on the following day the bird did not wait for me to put out my hand but left the nest, walking along a branch in my direction and opened the attack by pecking me on the hand. She then returned to the nest and settled down on her eggs again.

I have seen very many incubating birds but never one which exhibited such extraordinary pluck and pugnacity. All the time she was delivering her attacks she gave vent to a peculiar low noise somewhat resembling the swearing of a cat. The eggs, seven in number, were slightly incubated, pale creamy white, close in texture, with a fair amount of gloss, and measure about 1·4″ × 1·05″.

B. B. OSMASTON, I.F.S.

DEHRA DUN, U.P., *July*, 1916.

No. XIII.—OCCURRENCE OF THE BAY-BACKED SHRIKE (*LANIUS VITTATUS*, VAL.) AND THE LATE STAY OF THE SHELDRAKE (*TADORNA CORNUTA*, GMEL.) IN THE DARBHANGA DISTRICT, BEHAR.

On the 30th of last month I got a specimen of the Bay-backed Shrike (*Lanius vittatus*). This is the first time I have ever come across this bird here, though I have been collecting now for many years.

Sheldrake (*Tadorna cornuta*) are far from common birds in the District. I have heard of one being bagged this last cold weather. On the 12th of this month one was obtained here, a fine drake with an exceedingly well developed knob on his bill. The bird was by itself in a small patch of

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water, really more mud than water and did not appear to be suffering from any shot or other wound, though he was rather thin. This is very late indeed for him to have been here and why he should have settled on this tiny piece of watery mud I do not know.

BAGHOWNIE FTY, LAHERIA SARAI, P.O., CHAS. M. INGLIS.
16th *May* 1916.

No. XIV.—THE LATE STAY OF THE SHELDRAKE (*T. CORNUTA*) IN THE DARBHANGA DISTRICT, BEHAR.

Since recording the bird got by me on the 12th of this month, I happened to be looking through my notes on birds and find that I recorded a Sheldrake being brought to me on the 11th May 1903, or within a day thirteen years ago. It would thus appear that these birds are very late stayers at least in this district. The former record is in Vol. XV, page 350, of this Journal.

BAGHOWNIE FTY, LAHERIA SARAI, P.O., CHAS. M. INGLIS.
16th *May* 1916.

No. XV.—NOTES ON THE BIRDS OF MESOPOTAMIA.

I send a few notes on the Birds of Mesopotamia, which I trust will prove of interest. These are compiled from records I have kept during some years residence in Basrah, and from two trips I made to Ahwaz and Shuster in April 1908 and May 1913.

I have not included in this list certain birds which I have not identified, but mention a few of them briefly here. Near Shuster in May 1913, I found quite a number of large Reed Warblers, and one nest half built, possibly these were the Clamorous Reed Warbler. Many birds probably Willow Warblers are seen at Basrah in the spring, also Wagtails but I am not sure whether Blue headed or Black headed. I have taken Larks' eggs at Basrah, where Larks are very common, but I cannot say for certain what species. I noticed many small Owls between Ahwaz and Shuster, also in April 1908 I found the nest with young at Ahwaz of a very large species of Owl, possibly Eagle Owl. Harriers, Buzzards and larger birds of prey are very common in winter. Pelicans are often seen in winter on the river, and wild fowl and the Sandpiper tribe are very numerous during the winter months.

With regard to mammals I have occasionally found Hedgehogs at Basrah, which from the description in Mr. Kinnear's notes on the animals of Mesopotamia, I should think would be the Syrian Hedgehog. Wild cats are found at Ahwaz. Mungooses are very common at Basrah. The Hyæna has also been found near Basrah, and the Porcupine at Ahwaz.

I send you under separate cover the rough skin of some sort of Shrike which I shot here on 15th April last. I have not noticed this species before in Basrah, and I should be very glad if you would kindly let me know what it is.*

Raven, *Corvus corax laurencii*. In April 1908 I observed a pair at Ahwaz, also found the nest just ready for eggs.

Persian Hooded Crow, *C. capellanus*. Resident at Basrah where it breeds in palm trees. 5 eggs, 4th March 1913, 4 eggs, 7th March 1913, also breeds near Ahwaz.

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* *L. nubicus*, the masked shrike.

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Eastern Hooded Crow, *C. cornix sharpii.* Not uncommon at Basrah in winter leaving in the spring.

Rook. *C. frugilegus.* Large flocks seen at Basrah in winter.

Mesopotamian Babbler, *Argya caudata altirostris.* I have taken eggs usually 5, both at Ahwas and Busrah, in April and May. Eggs I have taken seem to vary in size, possibly not all being of one race.

White-eared Bulbul, *Pycnonotus leucotis.* Resident and very common at Basrah, where it breeds throughout April, May, June and July laying 3 eggs more rarely 4, also found breeding near Shuster in April 1908.

Grey-backed Warbler, *Aedon familiaris.* Abundant at Basrah where it arrives in the spring, breeding at the end of April and during May and June usually laying 4 eggs more rarely 5, which vary a good deal in type. Nest is very often found in young palm trees or against the trunk of a large palm tree, 3 or 4 feet from the ground. One nest I found was within a few inches of the ground. Also breeds near Ahwaz and district.

Eastern Olivaceous Warbler, *Hypolais pallida.* Very common at Basrah, where it breeds during the latter half of May and beginning of June, lays 3 more rarely 4 eggs. Nest usually 2 or 3 feet from the ground very often in rose trees, but sometimes quite high up in willow trees. Also found breeding up the Karun River.

Blackcap, *Sylvia atricapilla.* Common at Basrah spring and autumn migration.

Mènètriès Warbler, *Sylvia mystacea.* Found breeding at Ahwaz in early April 1908, and also on the Karun River towards the end of May. Found at Basrah breeding at the end of April and early in June. Generally found nest in scrub, and also in small pomegranate trees. Eggs 4.

Indian Wren Warbler, *Prinia lepida.* Not uncommon at Basrah in suitable localities where it breeds during the latter half of May and beginning of June. Eggs usually 4 or 5. Very common near Shuster, where I found quite 20 nests mostly half built on 27th May 1913.

Lesser Grey Shrike, *Lanius minor.* Seen at Basrah on spring migration.

Butcher Bird, *L. collurio.* do. do.

Woodchat Shrike, *L. auriculatus parodxus.* Not uncommon at Basrah during spring migration. Probably breeds up the Karun River, where I have observed birds early in June.

Grey Hypocolius, *Hypocolius ampelinus.* I have found this species breeding early in May up the Karun River and again on the 24th May I obtained two nests with 4 and 5 eggs respectively.

Common Starling, *Sturnus vulgaris caucasicus.* The small flocks seen at Basrah in winter are probably of this race.

Spotted Flycatcher, *Muscicapa grisola.* Seen at Basrah in May.

Indian Stonechat, *Pratincola rubicola maura.* Shot at Ahwaz, 9th April, also seen near Basrah in winter.

Isabelline Wheatear, *Saxicola isabellina.* Shot one at Basrah, 6th April, where it is not uncommon on spring migration.

Eastern Pied Wheatear, *S. morio.* Not uncommon at Basrah from autumn to spring. Shot one 6th April.

Black Redstart, *Ruticilla mesoleuca.* Seen at Basrah, 10th and 31st January 1908.

Persian Robin, *Erithacus hyrcanus.* Occasionally seen at Basrah in winter.

Syrian Blackbird, *Turdus merula syriacus.* do. do.

Song Thrush, *T. musicus.* do. do.

Black-throated Thrush, *T. atrigularis.* Have only once seen this species at Basrah, a single bird on 5th March 1911.

Rock Thrush, *Monticola saxatilis.* Observed at Basrah, 30th March 1909.

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Sparrow, *Passer domesticus indicus*. Abundant at Basrah, breeding throughout the summer.

Yellow-throated Sparrow, *Gymnorhis flavicollis*. Arrives at Basrah in April, breeding in holes of date trees generally high up, eggs obtained 21st May, 25th May and 4th June.

Desert Bullfinch, *Erythrospiza githaginea crassirostus*. Found breeding near Ahwaz at the end of March 1913.

Desert Bullfinch, *Rhodospiza obsoleta*. Found nest with 5 eggs near Ahwaz at the end of March 1913.

Black Headed Bunting, *Emberiza melanocephala*. Shot 3 out of a large flock near Shuster, 19th April 1908.

Swallow, *Hirundo rustica*. Breeds at Basrah, March-May.

Red-rumped Swallow, *H. rufula*. Observed two pairs near Ahwaz in April 1908 and also two pairs near Shuster, which were beginning to build on 19th April 1908. In May 1913 I could find no trace of these birds near Shuster, probably having been driven from their breeding place, which was then occupied by the Common Swallow.

White Wagtail, *Motacilla alba*. Common at Basrah in winter where it is generally seen in large flocks.

Red-throated Pipit, *Anthus cervinus*. Shot one near Shuster, 19th April 1908, and one at Basrah, 6th April 1909.

Egyptian Nightjar, *Caprimulgus ægyptius*. Nightjars breed near Basrah at end of May and beginning of June, but it is not quite certain, I think, if it is this species.

European Roller, *Coracias garrula*. A few pairs breed at Basrah, but it is not nearly so common as the Indian Roller. All the Rollers I observed up the Gargar River were of this species, where they breed in holes in the high banks of the river.

Indian Roller, *C. indica*. Common at Basrah, breeding towards the end of April in holes in palm trees. I have seen young just out of the nest at the end of May and also at the end of July, so it probably breeds twice during the year.

Blue-Cheeked Bee-eater, *Merops persicus*. Arrives in the spring, breeding at the beginning of June in mounds on the desert some miles north-east of Basrah.

Common Bee-eater, *M. apiaster*. Seen at Basrah in the spring, but passes on. Found breeding up the Karun and Gargar Rivers, young just hatched at the end of May.

Green Bee-eater, *M. viridis*. I have not observed this species at Basrah.

Pied Kingfisher, *Ceryle rudis*. Generally distributed, a few pairs breeding at Basrah. A few miles below Kurna, there was a fairly large colony of these birds. Also noticed on Karun River.

Indian Common Kingfisher, *Alcedo ispida bengalensis*. Resident at Basrah and not uncommon, breeds in May.

White-breasted Kingfisher, *Halcyon smyrnensis*. Resident and very common at Basrah, where it breeds. Eggs taken at the end of April and beginning of May.

Hoopoe, *Upupa epops*. Not uncommon at Basrah in autumn and spring.

Barn Owl, *Strix flammea*. Occurs at Basrah and has been known to breed there.

Egyptian Vulture, *Neophron percnopterus*. Common at Ahwaz, where it breeds. I took three nests there early in April. Once or twice observed at Basrah in winter.

Marsh Harrier, *Circus æruginosus*. Breeds in the marshes north of Basrah.

Sparrow Hawk, *Accipiter nisus*. Not uncommon at Basrah in winter.

Persian Turtle Dove, *Streptopelia turtur arenicola*. Migratory at Basrah, where it breeds May-June.

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Indian Ring Dove, *S. risoria*. Larger than preceding species, resident at Basrah where it is very common.

Pintailed Sand Grouse, *Pterocles alchata*. Occurs near Ahwaz in very large numbers, breeding there at the end of May.

Spotted Sand Grouse, *P. senegallus*. I have not observed many of this species but obtained eggs 19th June near Basrah.

Black Partridge, *Francolinus vulgaris*. Generally distributed in the Basrah district, where it breeds at the end of May and beginning of June. Much commoner up the Karun River and Tigris River.

Seesee, *Amoperdix bonhami*. Common between Ahwaz and Shuster, where it breeds. One nest, 11 eggs, I found in a hole in the river bank quite 12 feet from the ground. Another with 13 eggs in a hole on the side of a gully 28th May 1913.

Common Quail, *Coturnix communis*. Generally distributed in the Basrah district in winter though not very common.

Little Crake, *Porzana parva*. Shot at Basrah, 26th February 1908, also seen 16th May, 1909.

Water Rail, *Rallus aquaticus*. Not rare in winter. Shot at Basrah, 5th December 1912.

Moorhen, *Gallinula chloropus*. Breeds at Basrah where I have obtained eggs on the 9th, 16th and 21st June.

Purple Moorhen, *Porphyrio poliocephalus*. Not uncommon in the marshes north of Basrah where it breeds. Saw several in February in a large reed bed below Kurna.

Coot, *Fulica atra*. Common at Basrah in winter.

Macqueen's Bustard, *Houbara macqueeni*. Not uncommon near Zobair, also occurs near Ahwaz.

Stone Curlew, *Œdicnemus scolopax*. Shot one near Basrah, 21st February 1909.

Cream-coloured Courser, *Cursorius gallicus*. Shot 2 out of a flock of about ten, some miles north of Basrah, 29th January 1913.

Pratincole, *Glareola pratincola*. Have occasionally seen this species at Basrah in summer. Found it breeding at Ahwaz in May 1913.

Lapwing, *Vanellus vulgaris*. Met with in small flocks in the Basrah district in winter.

Red-wattled Lapwing, *Sarcogrammus indicus*. Resident at Basrah where it breeds mid April, also found breeding up the Karun River.

White-tailed Lapwing, *Chettusia leucura*. Not uncommon in marshy places near Basrah in winter.

Kentish Plover, *Ægialitis alexandrina*. Found breeding at Basrah, June.

Black-winged Stilt, *Himantopus candidus*. Resident and not uncommon at Basrah where it breeds early in June.

Avocet, *Recurvirostra avocetta*. Shot a specimen at Ahwaz 8th April, two seen in the marshes near Basrah, 6th December 1908.

Curlew, *Numenius arquata*. Not uncommon at Basrah in winter.

Black-tailed Godwit, *Limosa limosa*. Seen near Basrah in winter.

Common Sandpiper, *Totanus hypoleucus*. Resident at Basrah and generally distributed, immature birds seen in summer.

Wood Sandpiper, *T. glareola*. Seen at Basrah, 20th April and 20th—23rd May.

Redshank, *T. calidris*. Not uncommon at Basrah in winter.

Greenshank, *T. canescens*. One shot 6th December 1908.

Common Snipe, *Gallinago cœlestis*. Very abundant near Basrah in winter in suitable localities.

Jack Snipe, *Limnocryptes gallinula*. Generally distributed in winter in suitable localities near Basrah.

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Woodcock, *Scolopax rusticola*. Occasionally seen near Basrah in winter. Shot 2, 21st December 1907, one 15th January 1911, one 17th January 1909, and one 9th February 1908.

White-winged Black Tern, *Hydrochelidon leucoptera*. Occasionally seen at Basrah, observed a pair 8th June 1909, so probably breeds there.

Common Tern, *Sterna fluviatilis*. Breeds near Basrah early June.

Lesser Tern, *S. saundersi*. (?) do. do.

Common Cormorant, *Phalacrocorax carbo*. Not uncommon at Basrah in winter.

Pygmy Cormorant, *P. pygmæus*. On May 15th, I received a large number of eggs of this species, which had been taken in the marshes north of Kurna.

African Darter, *Plotus rufus*. Together with the eggs of the preceding species, were a large number of Darter's eggs taken from the same locality.

White Stork, *Ciconea alba*. Not uncommon at Basrah in winter, but does not stay to breed, breeds at Shuster and Baghdad.

Little Bittern, *Ardetta minuta*. Not uncommon at Basrah, I have taken eggs on 8th, 14th and 18th May, 7th and 14th June.

Bittern, *Botauris stellaris*. Not uncommon at Basrah in winter in suitable localities.

Flamingo, *Phænicopterus roseus*. Have seen this species in the marshes near Basrah.

Ruddy Sheldrake, *Casarca rutila*. In April 1908, I observed several of these birds on the Gargar River, where they were breeding, young being seen the previous year on the water about the beginning of June. At the end of May 1913 no trace of this species was observed in that locality, and from enquiries made from natives I gathered they had not been seen there during the two preceding years.

Mallard, *Anas boscas*. Common near Basrah in winter.

Gadwall, *A. strepara*. Common near Basrah in winter.

Common Teal, *Nettion crecca*. do. do.

Wigeon, *Mareca penelope*. Winter, Basrah.

Pintail, *Dafila acuta*. do.

Shoveler, *Spatula clypeata*. Occasionally shot in winter near Basrah.

Pochard, *Nyroca ferina*. do. do.

Red-crested Pochard, *Netta rufina*. Common near Basrah in winter.

Tufted Duck, *Nyroca fuligula*. do.

Great Crested Grebe, *Podiceps cristatus*. Occasionally seen in winter near Basrah.

Indian Little Grebe, *P. albipennis*. Resident at Basrah. On 9th June 1908 I found six nests containing 6, 5, 5, 4, 4, and 3 eggs respectively, these were all within an area of a few hundred square yards.

BASRAH, 18*th July* 1916. A. G. TOMLINSON.

No. XVI.—BIRDS' NESTING ROUND FEROZEPORE.

Possibly my experience round Ferozepore may prove interesting to some ornithologists and useful to others. I have not taken the nests of the species written about, myself, and it must not be assumed that countless other birds do not breed here as well.

The Striated Babbler, *Argya earlii*. This bird is pretty fairly common anywhere near irrigation canals, rivers or in the neighbourhood of water, where sarkari grass is to be found. It haunts such localities and nests in the tussocks. The nest is a neat tidy cup, well finished off, and concealed

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in the centre of a tussock. I have taken nests from April to July, but fancy it breeds at other seasons as well. Like the rest of their tribe, they are fairly noisy. They are gregarious even while nesting. When a nest is discovered, a whole lot will come and assist the owners in "strafing" you. Though well concealed, the nest is not difficult to locate, for if a bird has a nest it very soon discloses it by flying to it.

The Southern Green Pigeon, *Crocopus chlorogaster*. While driving along the public road in June, a Green Pigeon flew across, with a twig in its bill and disappeared into the leafy end of a branch of a siris tree. I watched a moment. It came out, flew into the tree I had first seen it coming from and returned, shortly after, with another twig. So I knew it was nesting. The nest was so well concealed that it was very difficult to see from below. On the 20th June, I went out and took the nest, which contained two fresh eggs. I had to shoot the bird, much to my dislike, else I could not be sure of the identity. The nest was of the usual pigeon type. A few pairs come to the neighbourhood of Ferozepur to breed. This, however, was the only nest I took myself. The bird is a close sitter and as the nest is so well concealed, it is not easy to discover except during building operations My shikari brought me another clutch.

The Blue-tailed Bee-eater, *Merops phillipinus*. About May, this bird comes in pretty good force to Ferozepore to breed. For the remainder of the year, it is absent, though a straggler may be occasionally seen. This homing instinct is really rather extraordinary, considering how very disagreeable Ferozepore is at this season of the year. On arrival, they take complete possession of the Fort, and commence nesting operations by tunnelling deeply into its mud face. On the 10th June 1915, I took several clutches, of from 6 eggs downwards, mostly on the fresh side. They nest on all faces, but the Northside seems to be by far the most popular. It is a very pretty sight to see them fluttering about in the sun and clinging to the nest entrance holes. This year a wire has been erected, which passes round the Fort, within a few feet of the holes. This provides excellent seating accommodation, of which the birds are not slow to avail themselves. In fact, I am sure they are of opinion that it has been put up solely for their convenience! Their nesting operations are, in a way, the cause of considerable damage. The nests are very close to one another. When heavy rain falls, as has been the case this year, the water runs down and collects in the egg chambers, causing the earth to bulge and finally to fall out, leaving gaping places in the face of the wall. As soon as the young have been raised, the birds depart.

The Common or Grey Quail, *Coturnix communis*. This bird passes through twice a year, in great numbers, *viz.*, about March-April, and again September-October, when large bags are made, with the aid of "call-birds." My shikari, who is very reliable and honest, and what is more about the only one I have come across who knows one bird from another and can differentiate between two such similar birds as the Common and Striated Babblers, says that they bred here freely. I must own I was a little sceptical. In the evenings and mornings, from about the middle of February, or perhaps a little earlier, while returning from and going out duck and snipe shooting, I heard them calling all round. I asked the shikari what this meant. He answered that they would soon be nesting. Sure enough, he brought me a clutch of 6 fresh eggs on the 16th March, 7 incubated on the 22nd, and 4 fresh on the 28th idem. There is not a shadow of a doubt that the eggs are those of the Grey Quail. So far the theory is that only

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pricked birds remain behind to breed. These eggs were, however, taken before the return migration and were those of birds who reside here, for they are to be met with throughout the cold weather but not in large numbers. If I happen to be here next breeding season, I will try and go deeper into the subject.*

The Rosy Pastor, *Pastor roseus*. This bird does not breed here, but passes through in great numbers in March and April, all heading West, for that purpose. It really is most interesting to watch the bird-stream migrating, all one way. A flight may occasionally wheel round, but only for a short distance, perhaps to get its bearings, when round, it comes again. I saw the first flight of returning birds, some 50, on the 3rd July. There was only one. It was not till the 20th, that I saw them in any numbers. They were then all following the Ferozepore-Ludhiana Road. Flight after flight, all flying swift and low, like an army hurrying up reinforcements and in deadly earnest. They did not hesitate, settle or look around, but went straight on. I rather wondered why? Since then, the main body has arrived. They are to be seen everywhere and do not seem in any hurry to move on, in fact seem quite contented with Ferozepore.

The place I call "Bulbul Cantonments" consists of two long narrow strips of country, about 40 yards wide, extending some 2 miles on each side of the Grand Trunk Road, 5 miles out from Ferozepore. It is studded with low trees, thorn bushes and tussocks of Sarkari grass. In this patch, I have taken the eggs of the Rufous-fronted Wren Warbler, *Franklinia buchanani*, the Streaked Wren Warbler, *Prinia lepida*, White-eared Bulbul, *Molpastes leucogaster* and found the nest of the Long-tailed Grass Warbler, *Laticilla burnesi*.

The Rufous-fronted Wren Warbler, *Franklinia buchanani*, is fairly common and draws attention to itself by its merry song, which it delights in. Its nest is invariably placed low down in a thorny bush, usually ber, almost on the ground. It is domed, well and strongly constructed with a side entrance. The only way to find it is to watch the bird building, as the nest is so well concealed that it is next to impossible to discover it in any other way. I took most of my eggs in August. Four appear to be the full complement. The process of extracting the eggs from the nest is painful, as it is surrounded with thorns. In fact, I found thorns actually protruding through the bottom of the nest, which must make it very uncomfortable for the incubating bird.

The Streaked Wren Warbler, *Prinia lepida*. This little fellow has a very indifferent little lay, doubtless it possesses charms for his lady, judging by the way he persistently pours it forth, "twitting" from here to there. The nest is domed and very similar, though lighter in construction, to that of the Rufous-fronted Wren Warbler. It is either situated in a tussock of Sarkari grass or low down in a thorn bush. The usual complement is 4, but I have taken 5 eggs from a nest. I took the eggs in July and August, doubtless it may breed earlier and later.

The White-eared Bulbul, *Molpastes leucogaster*. This bird does not migrate from "Bulbul Cantonments." I have seen it there at every season

* An interesting note on this subject will be found at p. 200, Vol. XXII., of our Journal, where Capt. Lindsay Smith described the breeding of the Common or Grey-Quail in the Lyallpur District of the Punjab.—EDS.

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of the year. Never having taken a nest myself, I was very anxious to do so and laid myself out to this end. I started in May, when I came on a pair building. From this nest, I obtained 3 fresh eggs on the 21st. On the 23rd, I found another with two half fledged young and on the 28th, a third with 3 hard-set eggs. After this, I had many disappointments, for although I marked down many nests being built, when one or two eggs had been laid, they disappeared. In despair, I had to content myself with incomplete clutches, else I should have got very few. After the middle of July, however, I did manage to get a few full clutches. On the 27th July, I took 2 eggs from a nest and on passing on the 30th, found the birds still there with another egg. This is the first time I have ever known a bird, of this species, returning to a nest from which all the eggs had been once taken. The nest is of the usual bulbul type, a flimsy cup, placed within hand reach, in any convenient shrub or bush, no attempt at concealment being made. Doubtless this is the reason why so many disasters overtake them. They certainly have to struggle hard to raise a family. E.H.A.'s remark that the bulbul performs the function of the domestic fowl to crows and such like by providing the egg for the breakfast table seems to be very near the mark ! !

The Long-tailed Grass Warbler, *Laticilla burnesi*, makes a very joyful noise from his perch, with a full throat, but for this he would be very difficult to spot for he is an adept at the art of lurking and slipping away unseen. I have as yet found only one nest on the 10th August. This was situated in the centre of a tussock of Sarkari grass, very low down, well concealed and difficult to find. It contained one egg. On visiting it again on the 13th, I found the egg gone. The nest is a compact cup, built on a bit of a foundation and well finished off. I think I shall probably find some nests shortly for although I have been on the look out for them throughout June, July and August, this is the only nest I have found nor have I seen them building, so I fancy they are late breeders.

The Black Partridge, *Francolinus vulgaris*, is very common. My shikari has brought me in several clutches, but I have only found one nest myself. This was on the 13th April, when I obtained 5 partially incubated eggs from a nest, just a hollow, scraped out of the ground, with a few bits of grass as lining, well concealed under a tussock of Sarkari grass. I discovered the nest by the hen getting up, just under my feet and running away.

The Punjab Red-vented Bulbul, *Molpastes intermedius*. I have not bothered much about this bird, but have found a few nests. The only one I have taken was on the 13th August. It was built, about 20 feet from the ground in the fort of a road side tree and contained 4 practically fresh eggs. A pair built a nest in my garden. When birds do this, unless they are of an extremely rare species, I never molest them. As the nest was about to be completed, I visited it, when I saw the bird perched on the place where it had been sited, but it was not there. I was rather disgusted. On looking round, I found it had been pulled out and thrown on to a neighbouring shrub. It was practically uninjured, so I replaced it, to the best of my ability, in exactly the same position it originally occupied. I returned to the spot two days later and was delighted to find that it had not been deserted and contained two eggs. However, a few days after I found the nest empty.

Towards the end of April, I spent a couple of days on the Sutlej after terns and such like. I found the islands, on which breeding took place,

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were very low and I wondered how the birds were going to raise their families before the river came down. I had a feeling that they knew what they were about and that the water from the hills would be late. Last year it came down early in May, but sure enough this year it was very late, so I suppose the birds knew it instinctively and did not hurry. I got the eggs of the Little-ringed Plover, *Ægilitis dubia*; Great Stone Plover, *Esacus recurvirostris*; Swallow Plover, *Glareola lactea*; Indian River Tern, *Sterna seena*; Scissors' Bill, *Rhyncops albicollis* and the Little Tern, *Sterna minuta*. I took a great many nests. I never got more than 2 eggs from any nest of the Swallow Plover.

The Indian Hoopoe, *Upupa indica*, breeds very freely within Cantonments, but its nest is not very easy to find, owing to the habit of the hen bird sitting very close and seldom leaving the nest during the period of incubation. Mr. Dewar states that he does not know how many eggs this bird lays, but he has never seen more than one young bird following the parents. I have usually found 5 eggs. From observations, extending over many years, I have, more or less, formed the opinion that the majority of birds very rarely rear the same number of young as eggs laid. If this happened, the bird world would be much overpopulated. The young are duly hatched out but long before they reach maturity, they are thinned out by casualties. The best example I can quote of this was a pair of White-eyed Tits, *Zosterops palpebrosa*, who built in my verandah, which gave me opportunities for watching them. They laid 4 eggs and 4 young were duly hatched off. The parents seemed to unduly favor two, the result was that they rapidly out grew the other two by getting all the food and in a few days, one would never have thought they belonged to the same brood. The next process was that the two weaklings were ejected from the nest. It was no use replacing them, as they were soon "outed" again. The parents, unlike ourselves, seemed to possess no pity or affection for their sick little ones. Eventually the two strong ones left the nest. I do not think this applies so much to game birds. Nature seems to know that man takes his toll of them and consequently spares them.

The Common Roller, *Coracias indica*, is very common and breeds freely, chiefly in hollow trees. Their nests are not easy to discover as they are very wary. I have, however, managed to get a good number of clutches.

The Little Brown Dove, *Turtur cambayensis*. I think it is recognized that the Dove tribe select the most extraordinary sites for nesting, but I do not think I have ever come across a more curious one than the following. The punkah in my dining room is pulled by a leather thong, passing through a hole in the wall, and over a wheel or pulley. This pulley is supported by an iron frame on one side. On this frame a Little Brown Dove proceeded to build a nest. How it ever got any sticks to remain in position I do not know, however, it did so, but it was a very sorry and flimsy structure. The bird laid one egg and sat there while the punkah was being pulled and the wheel in motion, about half-an-inch off. Every vibration shook the nest, with the result that the egg slipped through and got caught up below on a portion of the frame. On this the bird gave up. What is so wonderful is why a bird should select a site where to build a nest is next to impossible and where there are so many other eligible sites vacant. This, however, seems to be peculiar to the Dove and one cannot help thinking it is the case with them of "If at first you don't succeed, try, try, and try again."

FEROZEPORE, *25th August* 1916. R. M. BETHAM, BRIG.-GENL.

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No. XVII.—"SOME OBSERVATIONS ON A COMMON HOUSE-LIZARD (*HEMIDACTYLUS FLAVIVIRIDIS*, RUPPELL) OF INDIA."

(*With a plate.*)

1. Introduction.

The present account embodies certain stray observations on one of the commonest house-lizards of India. The lizard is a *gecko* and was described as *Hemidactylus coctaci*, D. & B., in Boulenger's Volume on "Reptilia and Batrachia" in the "Fauna of British India" series. The correct name of the form however is *Hemidactylus flaviviridis*, Ruppell. (Nene Wirbelth, 1837, p. 18, pl. vi., fig. 6.)

In the Punjab it is the commonest lizard that one finds in the houses, though a few specimens of *Hemidactylus persicus*, And., are also found from time to time. It is the type of *Lacertilia* used for dissection by the B. Sc. classes of the Punjab University, hence the importance of knowing all one can about its habits.

I am under a deep debt of gratitude to my former Professor Lt.-Col. J. Stephenson, D.Sc., I.M.S., Professor of Zoology, and Principal, Government College, Lahore, for the kind interest he always takes in my work, for getting me the necessary literature and for all other facilities. I am also highly obliged to Dr. N. Annandale, D.Sc., Director, Zoological Survey of India, for the correct identification of the lizard, and for his ever ready help ungrudgingly given at all times.

2. Seasonal Occurrence.

In the summer (March to November) the lizard is found in the houses in very large numbers, moving on the walls, and on the ceilings, but with the approach of winter the lizards retire to holes in the ceilings, or any other hiding place, where they hibernate, coming out of their retreats about the beginning of March. Throughout the winter one never sees any of these lizards, one that the present author found in the month of December in a crevice in the roof of a *kucha* house at Ferozpore, was found sitting quietly, it did not at all move even on teasing; the breathing was very slow, in short the vital activities were at a very low ebb, owing to the severe cold weather.

3. Measurements.

The male is much smaller than the female, and is much more active and agile, in build also it is much slighter, and can be easily distinguished even from a distance. The exact measurements of a male and a female specimen are as follows:—

	♂ *Male.*	♀ *Female.*
Length	123 mm.	150 mm.
Length of head	15 mm.	22 mm.
Breadth of head	9 mm.	13 mm.
Length of body	38 mm.	46 mm.
Length of tail	70 mm.	82 mm.
Breadth of tail at base ..	7 mm.	9 mm.
Length of fore-limb ..	19 mm.	28 mm.
Length of hind-limb ..	25 mm.	36 mm.

4. Colour and the Phenomena of Colour-change.

Boulenger in the "Fauna" (p. 92) describes the colour as follows:—"Grey above, uniform with indistinct darker markings; lower surface

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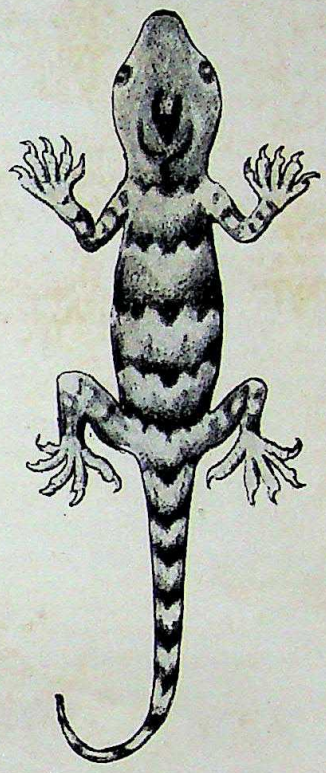

Fig 1.

Fig. 2.

Fig. 3.

Fig. 4.

Explanation of Figures.

Fig. 1. Lizard ♂ specimen showing the bands. Dorsal view.
" 2. One of the pigment corpuscles with the processes elongated, another with contracted.
" 3. Egg of the lizard.
" 4. Eye of the lizard showing the form of the pupil.

The Common House-Lizard (Hemidactylus flaviviridis) of India.

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white." This description is most probably based on spirit preserved specimens in which the colour had faded a good deal with age, or as will be clear from what follows; the specimens referred to had, or assumed a nearly uniform grey colour, on being captured; for the colour of the lizard during life is quite different from what has been quoted above.

Ordinarily the dorsal surface is grey, with five wavy bands of a black colour; the first band is on the neck. These black stripes are very prominent, and hence the grey colour is not very markedly visible at these times; the bands are rather dark in the middle, while the margins are of a lighter colour. On the lateral sides of the animal, instead of the bands being continuous, there are small dots scattered irregularly. On the head two *V*-shaped marks, one lying within the other, are to be seen; while the ground colour is also darker than the rest of the body. On the fore limbs there are six bands each, while on the hind limbs there are seven each, and on the tail there are eleven. All these bands have a wavy outline, specially well marked on the posterior side. (*Fig.* 1.) The ventral surface is yellowish. With the change of colour, the lizard is of the colour described by Boulenger, except that the ventral surface is yellowish.

The black colour of the lizard is due to black pigment corpuscles. The pigment corpuscles are not confined to the dorsal surface or the lateral sides only, but are found ventrally as well. The corpuscles which are found in the *dermis* are star-shaped (*Fig.* 2), sending out long processes from all sides; the processes resemble very much the pseudopodia of an *amoeba*, and are retractile like them; in fact the whole corpuscle is very much like an amoeba, sending out or retracting its pseudopodia under various stimuli; the change of colour of the animal is due to the sending out or retracting of these processes. The number of these corpuscles on the dorsal surface is about thirty-two in each scale, while on the ventral surface it does not exceed eight.

A few experiments were also tried to ascertain the changes of colour as brought about by the effects of temperature, light, darkness, and excitement. These are described separately under various headings:—

I. Temperature. About the first week of March, when these lizards assume their activity after a period of rest, and come out of their winter hiding places, the colour of the lizards is grey, but with the change of season one finds a gradual change taking place in the colour of the lizard as well. So that about the middle of May, the lizards show light stripes of a black colour on their bodies. About the beginning of June, the stripes become of a much darker colour, and now one seldom sees a grey-coloured lizard. In the Punjab, the summer season begins about the beginning of April, and the shade temperature which never goes higher than 70° F. during the winter, rises up to 120° F. in June, this shows clearly that the change in the colour of the lizard goes hand in hand with the rise of temperature. The lizards are of a lighter colour early in the morning, but assume a darker colour with the advent of the day. Moreover it was observed that the lizards became of a darker colour, when the glass jar containing these was kept in direct sunlight; to exclude the light-factor the jar was wrapped up in a black cloth. The lizards assumed their normal colour on being brought came into the room and the jar cooling down to the normal room temperature. The change of colour however is neither so sudden, nor so abrupt as to be considered due to a change in the environment, but comes about very gradually.

II. Light and darkness. Lizards exposed to a strong light, as for example the direct sunlight, become of a darker colour. Experiments were tried in which half of the body of a lizard was exposed to the strong light, while the other half was in darkness; in these cases the lizards became of

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a darker colour all over the body, not only in the parts exposed. Thus it appears that in this change of colour, which is due to the elongation or contraction of the colour corpuscles, the variations in the form of the corpuscles is not brought about directly by the presence or absence of light, but through the agency of the nervous system; the lizards becoming of a lighter or darker colour all over the body and not in parts only.

III. Emotions. If the animal be strongly irritated, it assumes a darker colour; but the change does not come about so suddenly as one would expect. The *male* geckos when fighting for the females have a darker colour than the normal; also before and after pairing the colour of the animals is much darker than usual.

The effect of keeping a jar containing one of the lizards near burning gas, was the darkening of the colour; this change, it appears, was due to the effect of the smell of the gas on the nervous system.

From what has been stated above, it is quite clear, that the power of colour change, from light to dark and *vice versa*, is developed to a fair extent in this common house-lizard. However the changes are not brought about by the environments, but are due to the effects of various stimuli acting on the animal through the agency of the nervous system.

5. Habits and Food.

The geckos are nocturnal in their habits, being seldom seen during the day, when they are often found hiding in crevices, or some other retreats, in the evening they begin moving about, and are most active at night. At night they are often attracted by lamp-light, during the rainy season they are often seen greedily devouring the large number of insects that at these times hover round the lamps. The lizards are usually seen moving actively on the walls and ceilings of the houses, the kitchens, bathrooms, storehouses, and such parts are most frequented. They are very shy, and not at all sociable in captivity. Though a great variety of food was tried in the case of some lizards in captivity, yet they refused all food, and became quite emaciated, all the bones were to be seen through the skin, practically no muscles being left. A male specimen lived for 117 days without food; during the last few days it could scarcely move, and the breathing was very shallow, it died of starvation. The various changes of diet tried in this case were house-flies, mosquitos, various other insects, caterpillars, earthworms and meat, but with no success. In captivity the lizards pass out small hard whitish pellets as their fæces.

In nature the food consists of house-flies, mosquitos, other insects and spiders. The stomachs on dissection showed large numbers of house-flies and mosquitos, and the lizards have been considered by Giles (A handbook of gnats or mosquitos. London, 1902) "as a valuable destroyer of mosquitos in houses."

6. Ecdysis and the form of the pupil.

The process of moulting or ecdysis was observed in the case of a gravid female specimen caught at Panipat on the 9th of March 1916. The animal was in very good health having been taken just after it had copulated. On the morning of the 10th, the moulting began, and went on till the morning of the 12th, when the whole skin had been cast off; in all the process was completed within 52 hours. At first the skin over the whole body became loose, and the animal looked as if wrapped up in a coat of milk white, transparent tissue paper. The animal was very restless and rubbed itself against the sides of the glass-jar in which it was kept. The skin did not come off in one piece, but was shed in pieces or flakes. At first a rent was observed in the mid-dorsal line of the body extending over the tail;

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then some others appeared in transverse planes separating the skin on the head, limbs and tail from that of the rest of the body. The skin on the head burst in the mid-dorsal line, and came off as one piece from the upper surface of the head, and from the large scales of the upper and lower jaws, as also from the floor of the mouth; with this piece also comes off a shining, transparent covering from over the eyes. Just before the membrane covering of the eyes is shed, the animal becomes very restless and is very nearly blind. Here a remark might also be made on the peculiar shape of the *pupil*, which is vertical, and is not a single slit, but three diamond shaped openings connected with one another (*Fig.* 4). The skin of the head had come off on the second day. The skin over the belly and back was shed in flakes, while that of the tail came off as a single piece through a rent along the mid-dorsal line; the skin over the limbs was coming off in flakes, and the process of the moulting of skin was completed on the morning of the third day by the lizard rubbing off the old skin over the lamellæ on the under surface of the hands and feet. The animal looked much darker in colour after moulting, and was very active.

There were a large number of *ticks* of a reddish colour attached to various parts of the body of the lizard, these did not come off with the cast, but bored through it, and remained attached to the animal.

7. Courtship and Pairing.

The author had many times seen these lizards fighting very furiously amongst themselves, but could not understand the reason; it was only when two of these were caught one day, that the mystery was cleared up. Both the lizards were biting each other, and holding very tightly in their clutches, and while fighting thus had fallen to the ground, where also the fight was continued. These on being sexed were both found to be *males*. Since then the author has many a times seen a single female being chased by three or even four males, and later found the males fighting amongst themselves for the possession of the female. It may be noted that these lizards are polygamous, and from this it appears, that as these fights are for the possession of the female, these will have to be referred to the heading of *Darwin's Sexual Selection*. The successful male after this begins what may be termed *Courtship*. This was observed at Panipat in the case of a male and the female already referred to, and it was this female which later on laid eggs, out of which the young ones hatched out. This pair of lizards was seen on the wall of a bathroom. The female was sitting quietly on the wall, while the male was moving round the female in circles at a fairly rapid pace, and looked greatly excited. It would sometimes stop, come near the female, nod its head, touch the female, and then again resume going round the female; it went on like thus for about ten minutes, when the male finally stopped by the side of the female, and lay parallel to it. The male now began to nod and touch the head and body of the female oftener, even so much as lightly stroking it; it would sometimes put out its tongue and just lick the female. The female also now became responsive and turned its head towards the male, thus the initial stages of courtship were completed. The male next gently climbed over the side to the back of the female, and began to stroke its head. The male was now clasping the female firmly and was wagging its tail. The female now raised her tail in a way to form an arch, the tip of it touching the ground. The male now began to slide a little to the right side, and brought his tail under that of the female till the cloacal apertures of the male and female came to lie opposite each other, and copulation took place. The animals remained in this condition for four (4) minutes, when the female became restless and began to slide from underneath. All this time

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the author was watching the lizards from a distance of about a foot, but the animals were too busily engaged to take any notice of him.

Both the male and female specimens were caught by means of a butterfly net. The two were kept together in a jar, but it was seen that the female at once began to bite the male, and would not allow it to stand near, so the two were kept in separate jars.

The pairing season, it appears, is the beginning of the hot weather, just after the long hibernation period.

8. Eggs and the Hatching of Eggs.

The female lizard was kept in a glass jar, the bottom of which was filled with powdered clay, and over which mosquito gauze netting was tied up, so as to allow free air in large quantity. The lizard laid two oval eggs on the 8th of March just about two months after copulation. Perhaps the delay in the laying of eggs, in this particular case, was due to want of nourishment, as the animal did not take any food whatsoever all the time. The eggs after being laid were covered by the mother with clay so as to be hidden from view.

The eggs are oval in shape, of a white colour, with a fairly hard shell. The size of an egg was 13·1mm × 11·2mm. (*Fig.* 3.)

Out of these eggs the young hatched out on the 13th of June, about 37 days after the eggs had been laid, by a piece of the shell breaking off from one side. No *egg-tooth* was to be seen on the head of the young ones.

9. The Young Lizard.

The young ones on hatching were very active, and were 58 mm. in length; the tail being 28 mm. The skin on the belly ventrally is very thin, and many of the organs can be seen through it.

About the end of May and after that one commonly sees the dark-coloured young lizards moving very actively on the walls of the houses. The breeding season of the lizard then would be from the beginning of March to the end of May.

BAINI PARSHAD, M.Sc.,
Alfred, Patiala, Research Student of the Punjab University,
Zoological Laboratory, Government College.

Lahore, *August* 1916.

No. XVIII.—THE BREEDING HABITS OF THE MAHSEER (*BARBUS TOR*).

It would be most interesting to know if any members of the Society can give me any information regarding the breeding habits of the Mahseer (*Barbus tor*). The question is a very interesting one, as apparently very little is definitely known on this subject.

Thomas in the *Rod in India* is of opinion that the Mahseer does not spawn all at one time, but lays a batch of eggs at one time and repeats the process several times in a season.

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I myself have caught female Mahseer with well-developed roe during several months in the year. I have seen fish at different times of the year working themselves over gravel and small stones in tributary streams and in very shallow waters. I imagine they were working out the gravel or small stones for the reception of eggs. Isaac Walton in the *Compleat Angler* says: "Carps are observed to breed several months in one year which the Pikes and most other fishes do not."

Possibly several members may have interesting notes on this subject?

G. A. NEVILL.

BALIPARA P. O., ASSAM, *July* 1916.

No. XIX.—*VANESSA XANTHOMELÆNA* FOUND OCCURRING BELOW 2,000 FEET ALTITUDE.

Mr. O. C. Ollenbach of Dehra Dun found some caterpillars of *Vanessa xanthomelæna*, in his garden here, about the middle of March last, from which he was fortunate in securing some good butterflies.

This is I think the first authentic record of these butterflies being found here or at so low an altitude, Dehra being under 2,000 feet. Mr. Ollenbach has one of the largest private collections in these parts if not in India, comprising butterflies from all parts of India, Burma and Ceylon.

W. W. CUMMING.

DEHRA DUN, U. P., *25th May* 1916.

No. XX.—SCORPION STING AND GARDEN RUE.

Some time back Mr. P. S. Patuck, of Narsingpur, C. P., sent a few leaves of a plant to our Society, with the following note:—"The plant is called in vernacular Sitab. These leaves pounded with salt are locally applied for scorpion sting, and I have to-day seen a case in which this remedy seems to have removed the pain in a few minutes."

The plant in question is the Garden Rue (*Ruta graveolens*, L. Sp. Pl. (1753) 383, var. *angustifolia* Hook. f. in Fl. Brit. Ind., I, 485). I at once started hunting for some information regarding the medical properties of Rue. I found many curious things, in old and new books; but it was only after a long search that I discovered a reference to its healing properties in cases of scorpion sting, and that in a book which was written in 25 A. D. It is impossible to describe the physiological action of the leaves without experiments; but I trust that a description of the plant, with a short sketch of its medical history, will be welcome to our members.

Description: Rue is a glaucous, hairless, erect, suffruticose, perennial plant, with branching stems, 2 or 3 feet in height, woody below with a greyish rough bark; herbaceous and smooth above. The leaves are alternate two and three, pinnately divided; the leaflets are sessile, cuneate, spathulate-oblong or linear-oblong, glaucous or bluish-green, 6-10 lines long, gland-dotted, terminal ones obovate-cuneate. The flowers are yellow, or pale greenish-yellow, in divaricately spreading corymbs; pedicels longer than the capsule; bracts lanceolate. Sepals triangular, acute. Petals 4, yellow, unguiculate, concave, wavy, a little irregularly toothed. Stamens 8, longer than the petals; filaments subulate; anthers ovate, obtuse, yellow. Ovary sessile; ovules pendulous from the axis of the

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cells ; styles 4, distinct at the base, where they spring from the inner angle of the carpels above the common axis ; united upwards into a single pistil which is attenuated toward the apex ; stigma 4-flowered. Fruit a roundish capsule, warted, 4-lobed, each lobe opening into 2 valves ; seeds angled ; testa pitted, albumen fleshy ; embryo slightly curved.

Synonyms : Ruta angustifolia, Pers. Enchir. I, 464.—*Ruta chalepensis*, Vill. Hist. Pl. Dauph. IV, 383 ; Wall. Cat. 7113. (According to Hooker in Fl. Brit. Ind. I, 485, it is Wallich who has given the name *chalepensis* ; as a matter of fact, however, Wallich has only adopted Villars' name which had been given to the plant a number of years before).

Distribution : From Greece through Southern France to the Canaries and northwards to Central Germany. North Africa. In most other countries introduced.

Cultivation in India : As to the time when the plant was introduced in India, I have found only one note by Whitelaw Ainslie in his Materia Indica, where he says : " It (the Rue) is growing in the botanical garden of Calcutta, introduced from Europe and Asia in 1800. It is also growing now in Ceylon." As to the Bombay Presidency, Graham (1) writes in 1839 that it was cultivated in gardens, but that it was by no means common. In 1861 Dalzell and Gibson (2) say that it is " now extensively cultivated below the Ghats." At present it is grown in gardens throughout India, especially on the hills. It grows freely in any good soil and is propagated by cuttings in the damp weather.

Popular names :

English : Rue, Common Rue, Garden Rue, Herb of Grace. The name Rue is derived from the Latin Ruta, which is the same as the Greek rhute, the Peloponnesian word for the plant known as peganon, the name of a bushy herb, belonging to the genus Ruta, especially Ruta graveolens. It was called Herb of Grace from its association with "rue", sorrow, repentance Old English hreow, from hreowan, to be sorry for).
German : Raute (Middle High German : rute, later High German about the 11th century, ruta).
French : Rue.
Italian and Russian : Ruta.
Spanish and Portuguese : Ruda.
Hind. : Sadab, pismarum, satari, amda.
Bombay : Satap.
Mar. : Suddab, Satapa, suntap.
Guz. : Seradab, Sitapa.
Kan. : Nagadali-sappu.
Decc. : Saaf, Sadaf, pismarum, satari.
Central Prov. : Sitab.
Punj. : Sudab, katmal.
Uriya : Maruya.
Bengal : Ispund, ermul.
Tamil : Aruda, Arvada.
Tel. : Suddapu aku, Sadapa, Arudu.
Sing. : Aruda.

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(1) Graham, J. Catalogue of the plants growing in Bombay and its vicinity. Bombay, 1839. Page 36.

(2) Dalzell and Gibson. Bombay Flora, 1861. Supplement, p. 17.

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Arab.: Sendib, aruda, fejan.
Pers.: Sudab.
Sanskr.: Sadapaha, somalata, Brami, bramu, sudapata.
Malay.: Sadsu, sadab.
Jav.: Inghu.
Jap.: Mats-kase-so.

History and uses:—This plant was well known to the ancients. Aristotle tells us in his Historiæ Animalium (1) that the weasel before fighting with serpents eats of the Rue plant, because the snakes hate the smell of it. (2) The famous Greek physician and medical writer Hippocrates (460-377 B. C.) says the plant is resolvent and diuretic and mentions it in the chapter on female diseases. In Pliny's opinion (3) the Rue is one of the best medicinal herbs; but he says at the same time that the juice of it taken in great quantity is a poison. As especially harmful he considers that of those plants which grow near the river Aliacmon and in Galatia. The Roman physician Celsus (about 25 A. D.) mentions the following amongst other good qualities of Rue: "Urinam movet, sensus excitat, purgat, mollit; cum allio recte miscetur ad scorpionis ictum." (4) Here it seems we have got the first mention of Rue being used against scorpion bite, but it must be mixed with onion. What Apuleius prescribes "ad profluvium mulieris" is more of a superstitious character: "Herbam rutam circumscribe auro et argento et ebore, et sublatam eam alligabis infra talum." (5) Rue was a principal ingredient of the celebrated antidote against poison used by Mithridates, King of Pontus:—

Obstat pota mero vel cruda comesta venenis,
Hoc Metridates rex Ponti saepe probavit,
Qui Rutae foliis, etc.

(Macer Floridus).

Rue was well known as antidote against the poison of the spotted cowbane (*Conium maculatum*, L.)

Rue is mentioned by the Arabians amongst their attenuentia, vesicatoria and stimulantia. Their most famous physician, Avicenna (978-1036) considers it to be an effective antidote against poisons: "Venenis resistet; itaque qui timet et suspicatur venenm sibi exbibendum, aut mordendum se a venenatis, seminris drahmam cum foliis ex vino bibat." (6) He distinguishes three kinds: garden, wild and mountain rue. "He considers it to be hot and dry in the third degree, to increase the mental powers, to act as a tonic and digestive, and to increase the urinary and menstrual excretions. He also states that it acts as an antaphrodisiac and causes abortion when given to pregnant women."

In Europe, during the Middle Ages, the plant was commonly supposed to be much used by witches. De Gubernatis tells us that the plant was hung round the neck as a charm against vertigo and epilepsy, that it was considered as an emblem of good luck and a protection against sorcery (7).

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(1) Aristotelis de Animalibus Historiæ ed. Did. lib. IX, cap 6.
(2) Dymock in his *Pharmacographia Indica*, Vol. I, p. 250, says that the "weasel rubs itself against this plant"; but there is no foundation for this translation in the Greek text.
(3) Plinius.
(4) Celsus lib. II, cap. v.
(5) Apuleius. Liber Apuleii de medicam herb. libæ, ex rec. et cum not Jo. Chr. Gottl. Ackermann. Norimb. et Altdorf. 1788. (This book has several times been ascribed to Apuleius Celsus.)
(6) Avicenna. Canon Med. lib. II, tract. II, p. 222.
(7) De Guberantis. La Mythologie des plantes. Under Ruta.

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For a long time the plant enjoyed the reputation of being protective against infectious diseases. It formed one of the chief ingredients of the so-called "Robber-vinegar" (also known under the names of Four robber-vinegar or Plague-vinegar) which was used as a preventive against plague. Even at the present day this preparation is used for fumigating sick rooms, though it has been proved useless by medical science. Johnstone wrote in 1632: "Ruta libidinem in viris extinguit, auget in feminis." (1) Boshrave (1668-1738) is full of praise for the virtues of Rue, especially in promoting perspiration. In the Schola Salerni we read the following lines:

"Ruta facit castum dat lumen et ingerit astum,
Cocta facit Ruta de pulicibus loca tuta."

In the East, too, this latter point seems to be known, as people place the plant in beds in order to keep off insects. Even cats and rats cannot stand the smell of the plant (2).

India received the plant from the West and with it a number of superstitious practices connected with it. The dried and burnt leaves are much used in S. India and the Konkan (3) for the purpose of fumigating young children suffering from catarrh. In a fresh state, after being bruised and mixed with arrack, it is employed as an external remedy in the first stages of paralytic affections. When dried in the shade and powdered, the vytians prescribe this substance together with certain aromatics in cases of dyspepsia. They entertain the same notion regarding it that Dioscorides did of old, *viz.*, that it is inimical to the fœtus in utero when given in conjunction with camphor and the sugar of the palmyra toddy. In the Punjab the leaves are taken as a remedy for rheumatic pains and also as an anthelmintic. It is also used for fowls in the roup.

Modern chemistry and pharmacy has very little to say about this famous plant. "By distillation with water the fresh herb yields a small quantity of volatile oil. This has a pale yellow colour when fresh, but becomes brown by keeping. Its odour is strong and disagreeable, and it has an acrid and nauseous taste. It has a specific gravity of 0·837 at 18° C, boils at 228°-220° C and solidifies between +1° and 2° into shining crystalline laminæ. Oil of Rue is chiefly a mixture of a hydrocarbon with an aldehyde or keton belonging to the series Cn H2n O." (4)

As to its uses, the few pharmacopœias that mention it at all, agree on the whole with each other. The following may be considered the substance of many lengthy descriptions: Rue is emmenagogue, ecbolic, anthelmintic and antispasmodic. In large doses it seems to be a narcotico-acrid poison. It causes abortion when used by pregnant females, accompanied with inflammation of the stomach and bowels. Sometimes it causes painful vomiting, always great prostration, confusion of mind, cloudy vision, feebleness and slowness of pulse, coldness of the extremities, and twitching of the limbs. Its action is chiefly directed upon the uterus, and is capable of exciting menorrhagia, inflammation and miscarriage. It has been successfully used in flatulent colic, hysteria, some nervous complaints, epilepsy, and as an excellent vermifuge. Oil of Rue has been observed to produce similar effects. Dose of the leaves, from 10-20 grains of the decoction, from 1-4 fluid ounces of the oil, from 2-6 drops.

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(1) Johnstone. Thaumatographia Naturalis in decem classes distincta. Amsterdam, 1632.
(2) Leunis. Synopsis der Pflanzenkunde. Vol. II, 357.
(3) Dalzell and Gibson. l. c. Suppl. 17.
(4) Watt. Dictionary of Economic Products, under Ruta.

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The official preparations are: Infusum Rutæ, Oleum Rutæ, Herba or Folia Rutæ.

ETHELBERT BLATTER, S.J.

ST. XAVIER'S COLLEGE, BOMBAY, *July* 1916.

No. XXI.—THE CONSTRUCTION OF A SPIDER'S WEB.

Wandering in my garden the other day, I came across a spider busy building its web; and the whole process was so ingenious and interesting that I watched it for several minutes, noting the spider's actions and the stages of the progress made. A brief account may interest readers of the Journal.

The spider was a small one, with a narrow hairless body about 15 to 20 mm. long, the colour being a reddish brown and yellow. Its four front legs were long, about three times the length of the body, the third pair short and the hind pair somewhat longer than the third pair. It is a species to be found fairly commonly in gardens in this part of the world, where its delicate webs may often be seen amongst the trees and shrubs.

I am sorry I did not see the very first stages of web construction as it would have been interesting to know exactly how the first base strands were fixed. When first observed, the web consisted of single threads connecting leaves in a roughly circular form with three or four of what may be called the 'ray' threads. At the centre was a small collection of specks of some white matter probably of the same material as the web itself. (See Fig. 1.)

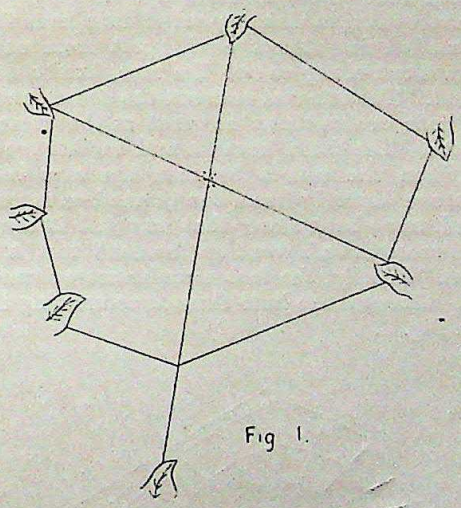

Fig 1.

The spider now proceeded to fill in the rest of the 'ray' webs. This was effected by running along one of the existing rays, fixing material on to one of the leaf connecting threads at such distance from the point of junction as could easily be reached without moving too far from the 'ray' on which it was, and then running back to the centre along the original ray. The new thread was then attached to some of the white matter at the centre. This was repeated over and over again, the spider working at random over any of the existing ray webs, sometimes along the one just previously attached, at other times along one in the opposite half circle and so on, till the ray webs were complete. The web at this stage was as in

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Fig. 2, the distances between the rays at the circumference of the circle being rather more than the spider could span.

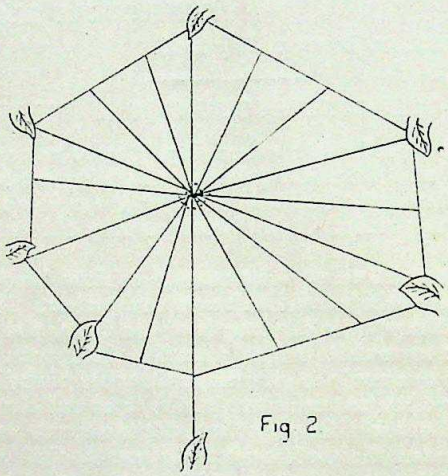

Fig 2

The spider now rested at the centre for a moment or two. It then began to spin rapidly round, its head remaining towards the centre and its anal extremity outwards. The spinnarets paused at each ray thread, fixed the new thread there and went on to the next ray. In this way, by a gradual moving out from the centre, a close spiral of four lines from the centre was formed, the threads being almost equidistant from each other. This done, the spider went out along one of the rays, fixed a new thread, and carried it right round. The interval between the fourth and the fifth cross threads was quite four or five times as great as the interval between the third and the fourth. The sixth, seventh and further cross threads were similarly put in. When the spaces between the rays became too wide for the spider to move directly from one to another, it went up one ray, attached the thread, came back along that ray till it could cross to the next by an existing cross thread, went up the next ray, attached thread, returned and so on. Finally, the last circular cross thread was fixed and taken round quite close to the base threads connecting the leaves. The web was now as on Fig. 3.

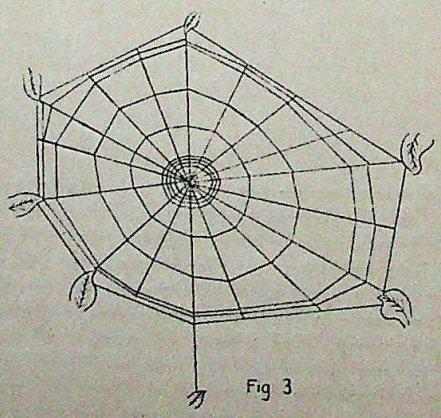

Fig 3

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Another short pause followed. Then our builder restarted at the outside of the web circle, and, working in the opposite direction, commenced to fill in the wide space between the outermost thread last fixed and the cross circular thread immediately inside it. The manner of doing it was the same as before except that the spider, which previously had worked in the same direction as the hands of a clock, now worked in the reverse direction and backwards towards the centre of the circle. The spaces between the cross webs now put in were a shade greater than the spaces between those at the centre of the circle.

In this way the spider reached and completed the cross thread next inside the penultimate cross circular thread put in on its outward journey. At this stage a sharp show of rain came on, and the spider stopped. The rain continued, the drops striking and shaking the whole web; whereupon the spider scuttled to the centre, eat up the collection of white matter and the converging ray threads at the very centre up to the first or innermost thread of the spiral. Here it now remained. The web was now as in Fig. 4.

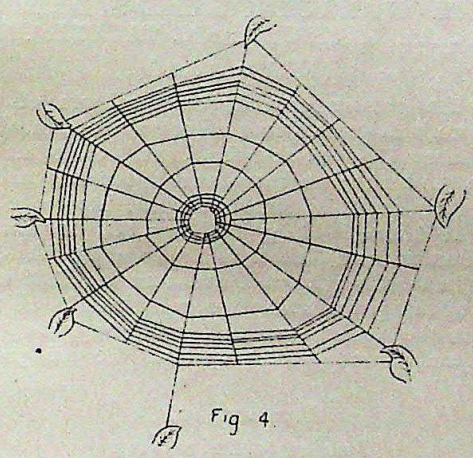

Fig 4.

The rain now drove me indoors. Coming out later I found the spider and web were exactly as I had left them; but later still, I noticed that the web had been completed, the cross threading to the narrower intervals having been put in all the way to the centre.

I was particularly anxious to see whether, when moving along an existing thread, the spider continued to weave and, so to say, duplicated the thread it was on. As far as could be made out, this was not the case. Weaving was apparently stopped and started afresh from the point at which the new thread was to begin.

(NOTE.—In the figures, I have reduced the number of threads, both ray and cross, so as to avoid taking up too much space. They are about $\frac{1}{6}$th size of original; but no attempt has been made to draw them to scale, as this would only confuse the lines.)

G. DERHÉ—P.

LAHORE, 21*st August* 1916.

No. XXII.—WHITE ANTS CROSSING OPEN GROUND.

Before we left Bombay last April, we stored a large tin-lined dealwood box in a room which was securely locked. The box rested on a teakwood floor

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about one or two feet from the wall. When the room was opened on our return ten weeks later, we found large portions of the outer surface of the box covered with red earth, while a great deal of the wood had been eaten away by white ants. The flooring was absolutely intact and there were no signs of any communication tunnel to show where the white ants had come from. There was, however, a small quantity of red earth where the wall met the floor about two feet from the box, so that the white ants must have crossed this distance in the open carrying the very large quantity of earth with which they plastered the box. Unfortunately they had ceased working before our return. One's usual experience with white ants is that they are averse to light and so from the point where they emerge from the ground build a tunnel as a means of communication until they reach the object of their ambition.

N. C. MACLEOD.

BOMBAY, *August*, 1916.

NO. XXIII.—NOTE ON AN UNDESCRIBED SPECIES OF *CYNODON* BY K. RANGACHARI AND C. TADULINGAM.

(*With a Plate.*)

While studying the grasses growing on the Farm of the Agricultural College, Coimbatore, this grass attracted our notice as it differed considerably from the ordinary *Cynodon dactylon*, Pers. On examining the specimens of grasses in the herbarium there were specimens matching this grass that were collected by Dr. C. A. Barber in the Districts of Tinnevelly and Godavari during 1901 and 1902, by M.R.Ry., C. Tadulingam in the Districts of Kistna, Guntur and Nellore in 1907 and by M.R.Ry. Rai Bahadur K. Rangachariar in the Chingleput District during 1898 and 1914. After a careful study of this plant and after reference to all the literature on grasses available in the Agricultural College Library, it appears to be to us, an undescribed and unrecognised species. So we propose naming it *Cynodon barberi*.

DESCRIPTION.

Cynodon barberi, sp. nov.

The plant is perennial. Stem are slender, radiately creeping close to the ground 30 to 60 cm. long, rooting at the nodes, invariably with two or three rarely more branches from each node; flowering branches slender, erect or ascending 2·5 cm. to 13 cm. high; internodes 2·5 to 6·5 cm., slightly flattened, pale, green or purplish.

Leaves—1 to 3·5 cm. long and 3 to 4 mm. broad, flat, linear, acute or subacute, scaberulous above and more so along the margins; sheaths short, smooth, compressed, with scattered long hairs at the mouth; ligule a narrow membrane with laciniate edge.

Spikes—3 to 5, slender, digitate, 2 to 4 cm. long, erect or spreading at the end of thin peduncles, pale green or sometimes purplish; rachis slightly angular.

Spikelets—One flowered, compressed laterally, sessile or obscurely pedicelled, imbricate, alternately 2-seriate on the ventral side of the rachis: rachilla produced into a bristle behind the palea, with or without minute pale membranous sterile glumes, a little longer than half the spikelet and disarticulating above the involucral glumes.

Glumes three.—Glumes I and II (Involucral glumes) dinstinctly unequal narrow, keeled with a strong keen nerve, lanceolate, keel shortly scabrid Glume I 1·5 mm. long acute. Glume II 2 mm. acuminate equal to or

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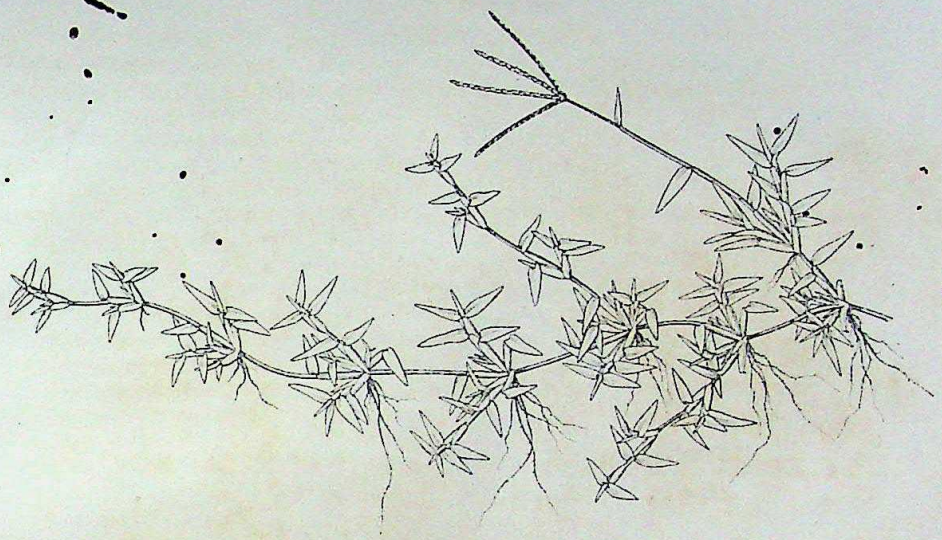

Fig. 1.

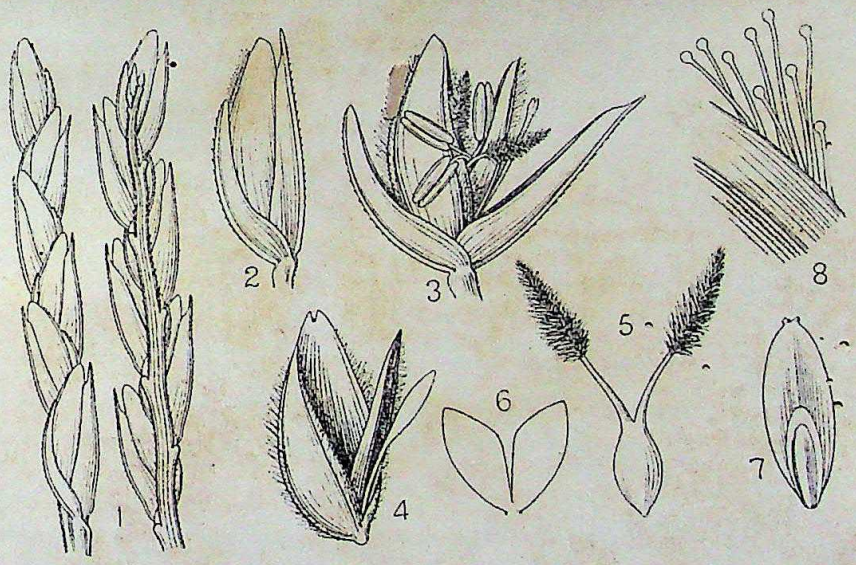

Fig. 2.

CYNODON BARBERI, sp. nov.

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slightly longer than Glume III. Glume III (floral glume) with a complete flower, obliquely oblong to ovate, subacute, truncate or 2-toothed with a minute mucro between sub-chartaceous, boat-shaped; nerves 3 pale, (not green as in *C. dactylon*), one median and the other two marginal not prominent, keel and margins densely pilose with distinctly clavellate hairs.

Palea firmly membranous, equal to slightly smaller than the third glume, linear oblong, two-keeled, densely hairy with clavellate hairs along the keels, 2-nerved, margins glabrous.

Lodicules 2 small.

Anthers 3.

Ovary glabrous, styles distinct and stigma feathery. Grain oblong, free within the glumes, smooth, pale, transparent, obscurely trigonous, the embryo scar about one-third to half the length of the grain.

Distribution:—Palamcotta, Tinnevelly District; Samalkota, Godavari District—C. A. Barber. Alluru, Bezwada, Maylavaram and Jaggayyapet, Guntur and Kistna Districts—C. Tadulingam. Vandalur and Sithamur, and Egmore, Madras-Chingleput District, Coimbatore, Coimbatore District;—K. Rangachari.

This species is closely allied to *Cynodon dactylon*, Pers., but differs from it in the following respects:—The absence of underground stoloniferous branches; leaves always being short and not pungent; spikes not exceeding 5; the second glume equal to or slightly longer than the third glume and never shorter; clavellate hairs on the keel and the margins of the third glume and also on the keels of the palea.

Fig. 1. A portion of the plant.

Fig. 2. Parts of the spike and spikelet.

1. Front and back views of a small portion of the spike.
2. Spikelet.
3. Spikelet with flower. (Note the rachilla behind the palea of the third glume without any glume.)
4. Third glume and its palea. (Note the rachilla with a minute glume behind the palea.)
5. Ovary.
6. Lodicules.
7. Grain.
8. Clavellate hairs.

K. RANGACHARI.

12*th September* 1916.

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PROCEEDINGS

OF THE MEETING HELD ON 21ST SEPTEMBER 1916.

A meeting of members and their friends took place on the 21st September, Lt. Colonel W. E. Jennings, I. M. S., presiding.

The election of the following 61 members since the last meeting was announced :—Mr. A. P. Stewart, Bombay ; Mr. Max Frei, Bombay ; Mr. James Prentice, Calcutta ; Mr. Roland Walker, Bombay ; Mr. H. G. Champion, I.F.S., Almora, U. P. ; Mr. J. H. Wapshare, Nilgiris ; Capt. J. A. Budden, Saugor, C. P. ; Mr. Ernest Wernicke, Darjeeling ; Capt. R. Blandy, Tiddim, Chin Hills ; Mr. A. C. Amman, Amolwa P. O., Champaran ; Mr. F. A. Betterton, Motihari ; Mr. P. Claxton, Dera Ghazi Khan ; Mr. N. W. Faith, Bombay ; Mr. Basil E. Buckwell, Rangoon ; Lt. A. B. Fletcher, Bannu, N.W.F.P. ; Mr. W. H. Matthews, Moradabad, U. P. ; Mr. H. C. Smith, Mogok, Burma ; Mr. G. G. Field, Moradabad, U. P. ; Major G. Taylor, R.H.A., Risalpur, N.W.F.P. ; H. H. Maharaja Kishen Singh, Bharatpur ; Mr. A. F. Wilson, Arkonam, Madras ; Capt. E. T. Walker, New Cantonments, Delhi ; Lt. C. W. Sanders, Satara ; Mr. J. R. P. Gent, I.F.S., Darjeeling ; Mr. F. J. S. Turner, Matara, Ceylon ; H. H. Raja Narendra Shah Sahib of Tehri, Garhwal State ; The Principal, Rajkumar College, Raipur, C. P. ; Mr. S. Tomkins, Corega, Mashobra *via* Simla ; Mr. S. Hampson, Bombay ; Capt. N. F. J. Wilson, R.I.M., Bombay ; Lt. H. S. Clogstoun, R.F.C., Egypt ; Mrs. H. Z. Harrison, Jodhpur ; Mr. C. P. Hervey, Trichinopoly ; Capt. J. A. S. Phillips, I.M.S., Mesopotamia ; Sub-Lt. E. Vane-Tempest, H. M. S. 'Mantis', Mesopotamia ; Mr. N. K. Kirpalani, Bombay ; Mr. Salim A. Ali, Tavoy, Lower Burma ; Mr. A. C. C. Hervey, Peshawar, N.W.F.P. ; Major W. B. Rankin, Jhansi, U. P. ; Dr. S. Wilkinson, M.R.C.S., Ajmer ; Lt.-Col. F. S. Walker, I.A., Jhansi ; Mr. G. A. V. Tyers, Salem, Madras ; Lt. L. G. W. Hamber, Dharmsala, Punjab ; Col. A. P. Douglas, R.A., Basra ; Mr. A. G. Tomlinson, Basra ; Mr. L. R. Fawcus, I.C.S., Calcutta ; Mr. Claude H. P. Allen, Sabarmati ; Mr. P. D. Patel, Bombay ; Mr. S. E. Histed, Bombay ; Capt. D. G. Cooper, I.M.S., Manjgur *via* Nushki ; Mr. W. Schmid, Bombay ; Major F. F. Rynd, Ceylon ; Mr. H. S. Hill, Rangoon ; Mr. W. West, Bombay ; Mr. F. M. S. Field, Mesopotamia ; Mr. L. S. Hudson, Bombay ; The Director, Burma Forest School, Pyinmana ; The Librarian, Patna College, Bankipore ; Mr. R. K. Richardson, Burma ; Mr. W. C. Morley, Bombay ; Mr. L. C. West, Hubli.

The Honorary Secretary acknowledged the following contributions to the Museum since the last meeting :—

Contribution.	Locality.	Donor.
1 Elephant's Skin, *Elephas maximus*.	Mysore	F. Hannyington, I.C.S.
6 Urial and 1 Markhor heads, *Capra falconeri*.	Bannu, N. W. F. P.	Maj. J. B. Scott.
1 Markhor, *C. falconeri*, 1 Urial, 4 Blackbuck heads, *A. cervicapra* and 2 Crocodile heads, *C. porosus* (mounted).	Various	R. H. Heath.

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Contribution.	Locality.	Donor.
1 Four-horned Antelope, *Tetraceros quadricornis* (skull and mask), 1 Mouse deer, *Tragulus memina.*	Dharwar	J. R. Jacobs.
2 Chinkara, *Gazella bennetti* heads.	Cutch	H. H. the Rao of Cutch.
2 Muntjacs, *Muntiacus aureus* ..	Sambalpur Orissa.	Tribikaram Pujari.
1 Muntjac, *M. vaginalis*, 1 Leopard cat, *F. bengalensis*, 3 Tibetan foxes, *V. ferrilatus*, 1 Himalayan fox, *V. montana*, 1 Panda, *A. fulgens*, 1 Particoloured Flying Squirrel, *Petaurista alboniger*, 1 Hodgson's Flying squirrel, *Petaurista nobilis*, 1 *Trogopterus himalaicus*, 1 Marten, *M. flavigula*, 1 Sikhim Water shrew, *Nectogale sikkimensis.*	Sikhim & Tibet..	C. H. Dracott.
Skulls of Malay Bear, *Ursus malayanus*, Panther, *F. pardus*, Wild Pig, *S. cristatus*, Skins of 1 Jungle Cat, *F. affinis*, 10 Black-backed Squirrels, *C. atrodorsalis*, 5 Phayre's Squirrels, *C. phayrei*, 1 Burmese Hare, *L. peguensis*, 1 Chinese Pangolin, *M. javanica*, and a few mice and shrews in spirit.	Shan States ..	Capt. W. J. Massey.
3 Wild Dogs, *C. dukhunensis*, 3 Jungle Cats, *F. affinis*, 1 Brown Palm Civet, 3 Clawless Otters, *Aonyx cinerea*, 1 Striped-necked Mungoose, *M. vitticollis*, 1 Nilgiri Brown Mungoose, *M. fuscus.*	Nilgiris	Nilgiri Game Asoc.
1 Wild Dog, *Cuon dukunensis* ..	Narsinghpur, C. P.	P. S. Pattack, I.C.S.
1 Indian Civet, *V. zibetha*, Leopard cat, *F. bengalensis*, Clawless Otter, *A. cinerea*, and Crab-eating Mungoose, *Mungos urva.*	Putao, Burma ..	P. R. Leonard.
6 Striped Palm Squirrels, *Funambulus*, 8 Rats, 4 Soft-furred Field Rats, 5 Shrews, 3 Bats, Snakes, Lizards, Frogs and several insects.	Kotagiri, Nilgiris.	Mrs. N. B. Kinnear.

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Contribution.	Locality.	Donor.
4 Foxes, *Vulpes*, sp., 2 Common Otters, *Lutra lutra*, 2 Syrian Hedgehogs, *Erinaceus Calligoni*.	Mesopotamia ..	Lt. G. C. Shortridge.
2 Desert Foxes, *Vulpes leucopus* ..	Salt Range, Punjab	Dr. M. Stuart.
1 Clouded Leopard, *Felis nebulosa*.	Paletwa, Burma.	W. S. Thom.
1 Flying Squirrel, *Petaurista lyeli*.	Magwe, Burma ..	F. C. Purkis.
1 Wooly Flying Squirrel, *Eupetaurus cinereus*.	Gilgit, Kashmir ..	Major A. D. Macpherson.
1 Common Flying Squirrel, *Petaurista albiventer*.	Gonda, U. P. ..	A. E. Osmaston.
1 Grey Flying Squirrel, *P. philippensis*.	Kanara ..	G. Monteath, I.C.S.
1 Malabar Squirrel (alive), *Ratufa indica*.	Belgaum ..	Mrs. R. Lawrence.
1 Manipur Striped Squirrel, *Tamiops macclellandi manipurensis*, 1 Perny's Squirrel, *Dremnomys pernyi*.	Chin Hills ..	Capt. R. Blandy.
1 Slow Loris (alive), *Nycticebus coucang*.	Bassein, Burma ..	Comdr. A. St. C. Bowden.
1 Mole, *Talpa micura*, 1 Shrew and 2 Bats (in spirit).	Copaldhara ..	H. Stevens.
2 Giant Herons, *Ardea goliath* (alive), 1 Purple Moorhen, *Porphyrio poliocephalus*, 2 White-bordered Bats, *P. khuli*, 1 Syrian Hedgehog, *Erinaceus calligoni*, 1 Mouse, 35 eggs of Large Pin-tailed Sandgrouse, *P. alchata caudata*, eggs and nest of Menetries's Warbler, *S. mystacea*, 1 Mesopotamian Spiny Lizard, *U. spinipes*.	Busrah, Mesopotamia	Sir P. Z. Cox, C.I.E.
1 Purple Heron, 3 eggs of Purple Moorhen, 36 Caspian Terrapins (alive), 12 Bats, 22 Snakes, 22 Lizards, 16 Frogs, 5 Fish.	Kurna, Mesopotamia	Lt.-Col. F. Wall, I.M.S.
2 White-bordered Bats	Sheik Saahad, Mesopotamia	Capt. C. M. Ingoldsby.
1 Masked Shrike, *L. nubicus* ..	Basra, Mesopotamia	A. G. Tomlinson.
1 Close-barred Sandgrouse, *P. lichtensteini*.	Muscat, Arabia ..	Major A. R. Burton.
3 Eggs of Sandgrouse (?) ..	Mesopotamia ..	Capt. Logan Hume.

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Contribution.	Locality.	Donor.
1 Palm Squirrel, 1 Ringed Dove, White-cheeked Bulbul, 7 Snakes, 3 Lizards, 3 Scorpions and a few insects.	Mand, Mekran ..	Capt. J. E. B. Hotson.
1 Bittern, *B. stellaris*	Rawalpindi ..	F. J. Mitchell.
1 White-fronted Goose (head and neck), 1 Quail.	Imphal, Manipur.	J. C. Higgins.
Burmese Turtle Dove	Mogok, Burma ..	F. Atlay.
25 Birds' Skins	Kanara ..	G. Monteath, I.C.S.
1 Barn Owl, *S. flammea*, 1 Ashy-headed Green Pigeon, *O. phayrei*.	Hasimara, Duars.	N. A. Baptista.
Cotton Teal (albino)	Madras	H. R. Hasted.
Blue-throated Barbet, *C. asiatica*, 1 Tibetan Snowcock, *I. tibetanus*.	Sikkim	C. H. Dracott.
Woodcock, *S. rusticola*	Putao, Burma ..	P. R. Leonard.
8 eggs of Common Kite, *M. govinda*.	Jacobabad, Sind .	J. R. Martin, I.C.S.
3 eggs of Raven, *C. corax*, 2 of Grey Partridge, *F. ponticerrianus*.	Sibi, Baluchistan..	A. E. Gordon.
Fat tailed lizard, *E. macularius* (alive).	Kohat, N.W.F.P.	Capt. Forster.
Snake, *Psamophis schokari* ..	Miranshah ..	Agency Surgeon.
Argus Tree Snake, *D. multimaculata*.	Minbu, Burma ..	R. E. Alleyn.
13 Snakes, 2 Flying Lizards, Frogs, Crabs, Scorpions, Centipedes, and Shells.	Pegu, Burma ..	J. M. D. Mackenzie.
Some *Fossil mollusca*	Pushti Kuh Range, Mesopotamia.	Capt. H. W. Napier.
2 Indian Wolf Skins, *C. pallipes* ..	Etawah, U. P. ..	Magistrate, Etawah.
1 ,, ,, *C. pallipes*. 1 Common Indian Fox, *V. bengalensis*.	Gadag	Mr. J. R. Jacob.
1 Wild Dog, *C. dukhunensis* ..	Ootacamund .	Secretary, Nilgiri Game Association.
7 Otter skins, *L. lutra*	Mesopotamia ..	Sir Percy Cox.
1 Indian Civet, *V. zibetha* 1 Indian Marten, *M. flavigula*.	Gangtok, Sikkim..	Mr. C. H. Dracott, C.E.
25 Birds, 2 Mice, 4 Bats, 1 *Vulpes*, sp., Grasshoppers and flies.	Mekran Mission, Baluchistan.	Capt. J. E. B. Hotson.
1 Bat, *Taphozous babylonica* ..	Mesopotamia ..	Capt. C. M. Ingoldsby
3 Mice, A few Grasshoppers and Beetles.	Do. ..	Lt. G. C. Shortridge.

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Contribution.	Locality.	Donor.
11 Bats	Teesta Valley, Darjeeling.	C. M. Primrose.
7 Snakes, 1 Centipede	Monachera, Cachar.	Mr. W. H. O. Shortt.
13 *Hydrophis tuberculata*, 2 fœti ..	Bangkok ..	Dr. Malcolm Smith.
1 *Hemibungarus nigrescens* ..	Kotagiri ..	Mr. L. J. Sedgwick, I.C.S.
6 Fish (alive)	Busrah	Capt. Stevens.
4 Embryos taken from Shark ..	Jask, P. G. ..	Major W. H. Lane.
1 Fat tailed lizard	Sarwakai, Waziristan.	Capt. W. B. Cotton.
16 Large pintailed Sandgrouse (alive).	Mesopotamia ..	Capt. C. R. S. Pitman.
1 Black Partridge (alive), 2 Skins, 1 Sand Snake.	Do. ..	Do.
418 Birds' eggs of 88 species ..	Assam, Burma and Andamans.	Mr. F. A. Grant.
A few Beetles, Spiders and Grasshoppers.	Amara, Mesopotamia.	Major F. P. Connor, I.M.S.

Minor Contributions from Evan A. Evans, Dr. N. Britto, M. Corbett, L. Newcome, W. Slaney, M. Cameron, Capt. R. C. Paris, R. M. Thomason, Maj. H. C. Kay, Mrs. Coen, W. S. Hoseason, V. P. De'Gama, W. R. W. Dawn, A. J. Butterwick, C. M. Primrose, W. Osmaston, J. E. Needham, S. H. Prater, Capt. R. B. Dent, W. S. Millard, Maj. J. W. Parrington, T. D. Moore, P. F. Gomes, P. O'Brien, H. H. Reed, Makeig Jones, A. H. Mc'Conell, R. Mullen, Hon'ble Mr. G. R. Lowndes, Col. J. R. Carter, Dr. H. H. Marshall, J. B. Punde, S. Hampson, S. F. Wilkinson, G. M. Coode and R. A. Spence.

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हरिद्वार

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